

INCH-POUND

DFP 420  
Revision D  
Cage 5B5M3  
13 May 2013

## DESCRIPTION FOR PURCHASE

### SET, STANDARD AUTOMOTIVE TOOL (SATS)

#### 1 SCOPE.

1.1 Scope. This specification describes a Set consisting of selected tools and equipment used to sustain a wide variety of tactical and combat equipment on the battlefield, primarily automotive vehicles. The Set supports maintenance activities in all areas of the battlefield, from the lowest level of maintenance conducted just out of sight of the enemy to the highest level of maintenance conducted in rear areas of the Theater of Operations. The Set consists of a core selection of tools and equipment suitable for support of the lowest level of maintenance. The tools and equipment are placed in rugged storage media integrated with a transportable, rapidly deployable, highly mobile, trailer-mountable tactical container. To increase the shop capabilities for maintenance at higher levels where needed, modular tool kits will supplement the core set. As of the date of issue for this specification, two such modules have been identified, and others are under study.

1.2 Classification. Items deliverable under this specification are:

Class I: SATS Core Set

Level 1: SATS Core set components integrated with trailer-mounted container.

Level 2: SATS Core set components with storage media.

Level 3: SATS Core set components only.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be use in improving this document should be addressed to: HQ ARDEC, AMSRD-AAR-AIL-TC, Rock Island IL 61299-7300.

AMSC N/A

FSC 4940

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Class II: SATS Module #1

Level 1: SATS Module #1 components integrated with the core set in the trailer-mounted container.

Level 2: SATS Module #1 components with storage media.

Level 3: SATS Module #1 components only.

Class III: SATS Module #2

Level 1: SATS Module #2 components integrated with the core set in the trailer-mounted container.

Level 2: SATS Module #2 components with storage media.

Level 3: SATS Module #2 components only.

## 2 APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. This section lists documents related to integration of the equipment and container. Specifications related to the tools and other items are contained in Appendices A, B, and C, as applicable. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

### 2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see paragraph 6.2).

## SPECIFICATIONS

### FEDERAL

A-A-50271

- Plate, Identification

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STANDARDS

FEDERAL

FED-STD-595                      - Colors Used in Government Procurement

DEPARTMENT OF DEFENSE

MIL-STD-129                      - Standard Practice for Military Marking  
MIL-STD-171                      - Finishing of Wood and Metal Surfaces  
MIL-STD-810                      - Environmental Test Methods and Engineering Guidelines

PAMPHLETS

DEPARTMENT OF THE ARMY

DA PAM 40-501                      - Hearing Conservation Program

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094).

2.1.2. Other Government documents, drawings and publications. The following other Government documents, drawings, and publications form a part of this document to extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DRAWINGS

NONE

2.2. Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents that are DOD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see paragraph 6.2)



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enclosing the items specified in Appendix A in storage media along with any other equipment needed to fulfill the requirements of this specification, including the Environmental Control Unit (ECU) and Auxiliary Power Unit (APU). As appropriate, the shop components shall be mounted in or on the container and plumbed or wired as necessary to form integrated, fully functional units. The SATS container, mounted or dismounted, must be capable of rapid deployment, employment, and re-deployment with minimal preparation, and of operating in unimproved areas. The SATS must be rapidly operational with minimal support upon arrival in a Theater of Operations.

3.2.1.1.2 Class I, Level 2. Class I, Level 2, shall consist of the items specified in Appendix A along with storage media identical to that supplied under Class I, Level 1, such that a Class I, Level 1 unit can be obtained by incorporating the Class I, Level 2 unit in a trailer-mounted SATS container. Class I, Level 2, items are exempted from requirements in this specification that are applicable only to integration with the container.

3.2.1.1.3 Class I, Level 3. Class I, Level 3, shall consist of the items specified in Appendix A. Class I, Level 3 items are exempted from requirements in this specification that are applicable only to integration with the container.

3.2.1.2 Class II. The SATS Module #1 shall consist of the items specified in the Components List found in Appendix B.

3.2.1.2.1 Class II, Level 1. Class II, Level 1, shall consist of self-contained, integrated units equipped for safe performance of a variety of maintenance and maintenance-related processes. Each unit shall consist of a standardized trailer-mounted, dismountable tactical container enclosing the items specified in Appendices A & B along with any other equipment needed to fulfill the requirements of this specification, including the ECU and APU. As appropriate, the shop components shall be mounted in or on the container and plumbed or wired as necessary to form integrated, fully functional units; however, the storage media for items in Appendix A shall be physically and visually separate from the storage media for items in Appendix B. The SATS shall be otherwise identical to those supplied under Class I, Level 1.

3.2.1.2.2 Class II, Level 2. Class II, Level 2, shall consist of the items specified in Appendix B along with storage media identical to that supplied under Class II, Level 1 for the Appendix B items, such that a Class II, Level 1 unit can be obtained by incorporating the Class II, Level 2 unit in a Class I Level I trailer-mounted SATS container. Class II, Level 2, items are exempted from the requirements in this specification that are applicable only to integration with the container.

3.2.1.3 Class II, Level 3. Class II, Level 3, shall consist of the items specified in Appendix B. Class II, Level 3 items are exempted from the requirements in this specification that are applicable only to the container.

3.2.1.4 Class III. The SATS Module #2 shall consist of the items specified in the Components List found in Appendix C.

3.2.1.4.1 Class III, Level 1. Class III, Level 1, shall consist of self-contained, integrated units equipped for safe performance of a variety of maintenance and maintenance-related processes.

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Each unit shall consist of a standardized trailer-mounted tactical container enclosing the items specified in Appendices A, and C along with any other equipment needed to fulfill the requirements of this specification, including the ECU and APU. As appropriate, the shop components shall be mounted in or on the container and plumbed or wired as necessary to form integrated, fully functional units; however, the storage media for items in Appendix C shall be physically and visually separate from the storage media for items in Appendix A. The SATS shall be otherwise identical to those supplied under Class I, Level 1.

3.2.1.4.2 Class III, Level 2. Class III, Level 2, shall consist of the items specified in Appendix C along with storage media identical to that supplied under Class III, Level 1 for the Appendix C items, such that a Class III, Level 1 unit can be obtained by incorporating the Class III, Level 2 unit in a Class I Level I trailer-mounted SATS container. Class III, Level 2, items are exempted from the requirements in this specification that are applicable only to integration with the container.

3.2.1.4.3 Class III, Level 3. Class III, Level 3, shall consist of the items specified in Appendix C. Class III, Level 3 items are exempted from the requirements in this specification that are applicable only to integration with the container.

3.2.1.5 Tools and related items. The components listed in Appendices A thru C shall be industrial or professional quality. Industrial/professional quality tools are normally distinguished from general-purpose and homeowner quality tools in that they are marketed to professional tradesmen for constant and rigorous use in commercial and industrial environments. Only industrial/professional quality tools that have verifiable marketplace acceptance shall be included in this Set.

3.2.1.5.1 Disclaimer. In order to help clarify the Government's requirements digital images of actual tools available in the commercial market place have been included along with text describing the tools. The use of any particular image does not imply that the Government has a preference for a specific brand of tool, nor does it imply that the tool in the image automatically meets our requirements, especially as they relate to those requirements driven by law regarding tools that must be made inside the United States or its territories or any other governing rules, regulations and laws. The text description of the tool is the controlling requirement. It is the responsibility of the suppliers and manufacturers to assure that each tool offered to fulfill the need meets all of the requirements related to the tool.

3.2.2 Workbenches. The container furnishings shall include at least two workbenches, each with a work surface not less than thirty inches wide and sixteen inches deep. The work surfaces shall be resilient enough to withstand impacts typical of maintenance operations without chipping, cracking, or splintering, and shall be highly resistant to damage from sun and rain. One workbench shall attach to the exterior of the container for operation, and shall be detachable for storage inside the container during transport. The other shall be portable and freestanding. Each workbench and its supporting structure shall be capable of supporting at least 250 pounds without suffering permanent deformation or other damage. The portable workbench shall have a work surface height of  $36 \pm 1$  inch and shall be self-supporting and stable on soft surfaces such as sand, mud, and snow. The mounts for the attachable workbench shall be adjustable to provide

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a working surface height of  $36 \pm 3$  inches both when the container is trailer-mounted and when the container is dismounted. An attachment point for bench-mount grinders shall be provided on one end of each workbench, but the grinder(s) shall be detachable for storage inside the container during transport, and dedicated storage location(s) shall be provided for that purpose. Dedicated storage locations shall be provided for the workbenches as well.

3.2.3 Vise mounts. The machinist's vise listed in Appendix A and the pipe vise listed in Appendix B shall have dedicated storage locations inside the container, but shall be provided with fixtures which permit them to be mounted in suitable locations on the outside of the container when needed. The vise mounts shall be adjustable to provide a vise base height of  $36 \pm 3$  inches both when the container is trailer-mounted and when the container is dismounted. When mounted on their fixtures, the vises shall have the full range of motion and uses anticipated by their design, including at least one position free of obstructions in the vertical plane of the jaws of the machinist's vise. In addition the vise mount and its supporting members (e.g. workbench, container frame, etc.) shall be rigid enough and stable enough to support the vise and work piece, and durable enough to withstand the forces exerted on the vise without sustaining permanent deformation or other damage. They shall be capable of withstanding both clockwise and counterclockwise torque of 100 foot-pounds on each of the three axes of the machinist's vise while supporting the weight of the vise plus a forty-five pound work piece.

3.2.4 Computer Workstation. The storage media for the Core Set shall include a cabinet-mounted computer workstation capable of housing a desktop personal computer with keyboard, monitor, and printer at a height suitable for access by a standing operator. The workstation cabinet shall incorporate a lockable fold-up door, storage space for a box of printer paper, and storage space for 50 CD Jewel Cases. The workstation shall be permanently installed in the container, and shall be provided with outlets connected to the container electrical system, and with data port(s) connected to the container communications pass-through panel.

3.3 Inputs and interfaces.

3.3.1 Container/vehicle. The trailer-mounted containers for the SATS shall be suitable for towing by an Army M1083 5 Ton Standard Cargo Truck and other Medium Tactical Vehicles (MTVs). MTVs will be the prime movers for the SATS; however the SATs container shall also be suitable for transport by Palletized Load System (PLS) trucks or trailers, as well as Heavy Enhanced Mobility Tactical Trucks with Load Handling Systems (HEMTT-LHS). During normal tactical operations the container will be trailer-mounted at all times; however, to provide maximum operational flexibility, the container-mounted SATS shall be capable of stand-alone operation when dismounted from its trailer, and when mounted on a pallet that is dismounted from a pallet transporter (i.e. PLS, PLS Trailer, and HEMTT-LHS). No SATS components or tools will be transported in the MTV cargo bed or on another vehicle. To meet these requirements, the SATS container shall conform to ANSI Rigid Wall Relocatable Structure standards for non-expandable shelters meeting ISO Type 1C or 1CX Freight Container standards, and the trailer shall be a skeleton-type container trailer such as the Army's Containerized Kitchen Trailer. Performance requirements for trailers are provided in Appendix E. Performance requirements for containers are provided in Appendix F.

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3.3.1.1 Government Furnished Material (GFM) modification. If utilizing trailers or containers provided by the Government, the contractor may modify Government-furnished tactical containers and/or tactical trailers as necessary to meet the requirements of this specification, provided the safety and performance of the MTV and towed unit are not compromised.

3.3.1.2 Size. When ready for transport the overall width of the SATS trailer shall not exceed 96 inches, and no part mounted to the container shall extend beyond the planes defined by the outer surfaces of the container corner blocks.

3.3.2 Human interface. The SATS shall be suitable for setup, operation, and maintenance by the majority of U.S. Army personnel, from the fifth percentile female to the ninety-fifth percentile male. Basic U.S. Army anthropometrics charts and applicable DOD human engineering guidelines are provided in Appendix D.

3.3.2.1 Task loading. The shop shall be easy to set up for operation and to prepare for transportation. The tasks required to prepare the SATS for ground transport after operation, and likewise to prepare it for operation after ground transport, shall not require two soldiers more than 1 hour.

3.3.2.2 Illumination level. The SATS container is required to provide permanently mounted 110 volt AC interior lighting. The lighting system shall provide both visible spectrum white light and Night Vision Device (NVD) safe light (i.e. blue-green light not detectable to NVDs) (see 3.4.2.2). The interior white lights shall provide general task illumination of at least 50 foot-candles (540 Lux), measured at thirty inches above the enclosure floor, and the light shall be distributed so as to minimize glare and specular reflection. If incorporation of the SATS components or storage media in the container will block the light from any fixture, the container lighting shall be rearranged or otherwise modified to maintain the task illumination at its required level.

3.3.2.3 Protective clothing. The SATS shall be operable and maintainable by personnel wearing heavy gloves and clothing suitable for cold weather (also see paragraph 3.3.2.4.2).

3.3.2.4 Storage.

3.3.2.4.1 Easy access. All equipment and expendable supplies in the container-mounted SATS shall be accessible by personnel standing inside the container (stooping and bending are permitted). To accommodate standing operation for personnel the distance from the floor to any overhead obstruction inside the container shall be at least 76 inches when in operational mode. An unobstructed height of 78 inches or more is preferred. Because the SATS containers will serve primarily as repositories for tools and equipment to be used elsewhere, ease of manual loading and unloading of SATS components while in operational mode is an important consideration.

3.3.2.4.2 Storage media. While selection and arrangement of storage media is left to the discretion of the contractor, the government anticipates that the majority of SATS components will be stored in drawers or enclosed shelving. The configuration of drawer and shelving units are subject to the following specialized human engineering constraints for this application:

The SATS container has an outside width limited to 96 inches, and if the contractor



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chooses to install drawers and shelving along both sidewalls, facing a center aisle, the aisle may be reduced to the absolute minimum. The aisle shall be wide enough to permit each cabinet door and drawer to be fully opened and to permit installation and removal of all drawers and shelves. While it is standard practice to provide sufficient aisle space to accommodate both a fully-open drawer and a person accessing the drawer from the front, the aisle space in this application may be reduced to accommodate the fully-open drawer or shelving door only; provided the soldier can reach the entire contents of the drawer or shelf and operate restraint devices (see paragraph 3.5.3) from either side. The width of the drawers and the location of their lock-in/lock-out devices shall accommodate the 5<sup>th</sup> percentile Army female functional reach of 25.2 inches, and the top of the highest drawer shall be no higher than 48 inches to accommodate the shoulder height of the 5<sup>th</sup> percentile Army female. Clearance in front of the handles of open drawers and clearance for shelving doors shall be at least 3" to assure soldiers wearing MOP IV gear and winter gloves are able to grasp them. To permit passage of 95<sup>th</sup> percentile Army males in bulky winter clothing, the aisle shall be no less than 27 inches wide at any point. The contractor is cautioned that some SATS components will not pass through an aisle that narrow, and the ability to load and unload said items must be taken into consideration.

Upon acceptance of the configuration and performance of the core set and each succeeding module when loaded in the SATS container, the component list for the core set and each module will be amended to include the requisite storage media (See Appendices A, B, & C).

3.3.2.4.3 Organized storage. Each item carried in the SATS container shall have a specifically designated storage location. The storage methods employed shall provide a probability of at least 0.8 that the operator can locate any individual component required to perform a maintenance mission in 3 minutes or less.

3.3.2.4.4 Proximate storage. Items normally used together shall be stored in the same area of the SATS container. The SATS provides tools specifically for service of equipment powered by internal combustion engines, primarily vehicles, as well as more generic capabilities for repair and service. The following task-oriented groupings of tools are provided as examples.

Lubrication – tools for greasing and oiling moving parts; injecting grease into standard fittings; packing and adjusting wheel bearings; dispensing oil; sampling oil for analysis; and for changing lubrication system and hydraulic system oils and filters.

Pneumatic and hydraulic brakes – tools for repairing and adjusting brakes; replacing brake shoes and pads; locating air leaks; and filling and bleeding hydraulic brake systems.

Wheels and tires – tools and equipment for repairing punctures; inflating tires; changing tires; repairing tire valves; removing and replacing wheel studs; checking and adjusting toe-in; lifting and supporting vehicles; and removing wheel and axle assemblies.

Electrical systems – tools and equipment for slave (jump) starting vehicles; charging batteries; servicing batteries (adding water and cleaning terminals); testing batteries and generating systems; replacing electrical terminals; and performing power and continuity checks.

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Cooling systems – tools and equipment for dispensing coolant; draining and filling coolant systems; straightening radiator fins; checking coolant strength; and for brazing and soldering radiators.

Fasteners – tools and equipment for installing and removing common fasteners, applying high torque, and applying measured torque.

Metalworking – tools and equipment for grinding metal, drilling and tapping holes, and cutting and restoring threads.

Cleaning and degreasing tools and equipment.

Woodworking tools

3.3.2.4.5 Linear products. Excepting the Booster Cable Assemblies (Appendix A, Item 23) and the Special Power Cable Kits (Appendix A, Item 24, and Appendix C, Item 5), flexible linear products more than ten feet long, such as hoses and electrical cords, shall be stored on reels or looms. Straps, ties, or other devices shall be provided for linear products not stored on reels or looms to permit them to be stored and hand-carried in neat coils.

3.3.2.4.6 Visual cues. The storage method used for each item shall provide the operator a visual cue when an item is not in its designated storage location.

3.3.2.4.7 Rapid inventory. The integration of the SATS into the container shall facilitate rapid inventory. The storage methods employed shall provide a probability of at least 0.8 that the operator can verify within two hours or less that all items in the core set are present and secured in their designated storage locations. In like manner there shall be a probability of at least 0.8 that the operator can inventory Module 1 in one hour or less, and Module 2 in one hour or less. In the event an item is absent from the shop, the operator shall be provided with the means to identify the specific item by name and description. There shall be a probability of at least 0.8 that any missing item be identifiable by name and NSN; or by name, part number, and supplier's CAGE code; within three minutes.

3.3.2.5 Plates and labels. All identification, warning, and instruction plates and labels shall be permanently affixed to the SATS container or individual components, as appropriate. They shall be resistant to deterioration caused by heat, cold, solar radiation, water, and petroleum products to the extent that they will remain intact and readily legible for the expected economic life of the SATS. Marking shall be accomplished in a manner that does not adversely affect the life and utility of the SATS or its equipment. All human readable plates and labels shall be printed in the English language, and may be supplemented by graphical symbols.

3.3.2.5.1 Item identification. A human readable information plate conforming to A-A-50271, Composition A, Class 2 or Composition D, and containing the following data shall identify each SATS container. The item identification shall be placed in a location on the exterior of the SATS container that is plainly visible when the SATS container has been closed in preparation for transport or storage.

- a. Nomenclature: (to be identified by contract/delivery order)

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- b. NSN: (to be identified by contract/delivery order)
- c. LIN: (to be identified by contract/delivery order)
- d. Specification data: DFP 420
- e. Manufacturer: CAGE or NSCM and PIN \*\*
- f. Serial Number: \*
- g. Acquisition instrument identification number: \*\*

\* Format optional

\*\* See definitions

3.3.2.5.2 Shipping data. A human readable shipping data plate shall be furnished for each SATS container and shall conform to A-A-50271, Composition A, Class 2 or composition D. Silhouettes of the SATS container in transport configuration that indicate the center of gravity of the fully-loaded trailer-mounted container along each axis as well as the locations of the lifting and tie-down provisions shall be included on the data plate. A separate shipping data plate shall provide the same information for the fully-loaded, dismounted container. The shipping data plates shall be placed in a location on the exterior of the SATS that is plainly visible when the SATS container has been closed in preparation for transport or storage.

3.3.2.5.3 Hazard identification. Unguarded physical hazards (see paragraph 3.5.1) shall be identified by human readable information plates. Product safety signs and labels shall conform to ANSI Z535.4.

3.3.2.5.3.1 Noise hazards. If the steady-state noise produced by the compressor(s) or other SATS components in any mode of operation exceeds 85 decibels (dB) on the A-weighted scale, noise hazard caution signs that require the operator to wear hearing protection shall be posted on the compressor or other component in conspicuous locations.

3.3.2.5.3.2 Lift hazards. Caution signs shall be provided for stored items that exceed the safe limits for a single person to lift using both hands (see Appendix D).

3.3.2.5.4 Warranty information. A human readable warranty information plate at least 5 inches wide and 2.5 inches high shall be furnished for each SATS container. The warranty information plate shall be located in a conspicuous location on or near the personnel door and shall conform to the following image.

	<b>Contact PM-SKOT for All Tool &amp; Tool Warranty Issues</b>
	1-877-4-PMSKOT (1-877-476-7568)
	DSN: 793-4765 / CM: 309-782-4765
<b>E-MAIL: <a href="mailto:pm-skot@ria.army.mil">pm-skot@ria.army.mil</a> WEBSITE: <a href="http://pmskot.army.mil">http://pmskot.army.mil</a></b>	

3.3.2.5.5 Unique Item Identification. Each SATS shall be marked with a Unique Item Identifier (UID) that has machine-readable data elements distinguishing it from all other like and unlike items in accordance with MIL-STD-130 (see note 6.5). Each UID shall be globally unique and unambiguous. The UID data elements shall be contained in a Data Matrix ECC200 symbol in accordance with ISO/IEC 16022. Excepting Commercial-Off-The-Shelf (COTS) items, any component of the SATS for which the cost to the Government will exceed \$5000 shall also be marked with a UID. For Class I, II, & III Level 1 sets, the UID shall be affixed to the container. For Level 2 Sets, the UID shall be applied to the storage media. For Level 3 Sets, the labels shall be securely fastened to the set shipping container(s) in a manner that allows the labels to be removed from the container(s) for filing.

#### 3.4 Environment.

3.4.1 Environmental protection. The SATS must provide spill containment equipment and supplies for maintenance operations involving coolant, fuel, solvent, petroleum, oils, and lubricants.

3.4.2 Survivability. The SATS must be survivable in the battlefield environment.

3.4.2.1 Protective coloration. For concealment, the exterior of the trailer-mounted container shall be provided with a color scheme that will blend in with the operational environment. Camouflage patterns supplied by the Army shall not be altered. Brackets or other hardware attached to the container exterior shall be coated to match the camouflage pattern in that area. Stairs, ramps, landings, handrails and other hardware required for access to the trailer-mounted container shall also be incorporated in the camouflage pattern and coated accordingly.

3.4.2.2 Blackout conditions. While in its operational configuration with the personnel entryway(s) closed, the container shall be light tight. None of the light generated when the interior lights of the container are illuminated shall be visible from any point outside the container. The personnel entryway will be provided with an interlock that opens the electrical circuit(s) for the interior lights so that the white lights are completely extinguished and replaced with NVD-

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safe lighting before the light-tight seal of the entryway is broken. The interlock feature will also be provided with a switch or other mechanism permitting it to be deactivated when not needed. Modifications to the container attendant to the installation of SATS components shall neither alter nor interfere with the operation of these features.

3.4.2.3 Nuclear, Biological, and Chemical Contamination Survivability. The trailer and the exterior of the SATS container will be nuclear, biological and chemical (NBC) contamination survivable to the extent practicable. The container interior as well as the tools, equipment, storage media, and expendable supplies mounted or stored in the shop container need not be NBC contamination survivable. Modifications to the trailer and/or container, including the installation of brackets or other hardware on the exterior of the container, shall not degrade the contamination survivability of the container. Cleaning, treating, and painting of the container shall conform to the requirements of MIL-STD-171, finish 7.3.1 plus 20.24 for aluminum, and finish 5.1.1 plus 20.24 for ferrous metals. (This is a military–unique requirement.)

3.4.3 Weather protection. The SATS container will protect its contents from rain; from accumulations of ice and snow; and from accumulations of road dirt, dust, and mud. Modifications to the container attendant to the installation of SATS components shall not degrade this capability.

3.4.4 Interior environment. The SATS container shall incorporate an Army Standard environmental control unit (a combination heater and air conditioner) supplied by the Government. The contractor will fully integrate the GFM environmental control unit in the SATS container.

3.4.5 Fungus and moisture. All hoses, electric cable covers and other elastomer parts that are exposed to air shall be fungus resistant.

3.4.6 Ozone. All hoses, electric cable covers and other elastomer parts exposed to air shall be ozone resistant.

3.5 Safety. The SATS shall not present any uncontrolled safety or health hazards throughout the life cycle of the system. The SATS shall incorporate the following features to assure safe operation.

3.5.1 Physical hazard control. Mechanical guards, electrical insulation, thermal insulation, and other safety devices shall be provided to protect operators and maintenance personnel from inadvertent contact with moving parts, electrically energized parts, high temperature surfaces, and other physical hazards (see Appendix D). The safety devices shall not interfere with operation of the SATS. Exposed sharp corners and sharp edges on SATS parts shall be eliminated if they serve no functional purpose. Hazards that cannot be eliminated, cannot be controlled by equipment placement, and cannot be controlled by protective devices shall be identified to the user by printed warnings or cautions.

3.5.2 Physical strain control. Caution signs (see paragraph 3.3.2.5.3) shall be provided for stored items that exceed the safe limits for single-person manual lift (see Appendix D).

3.5.3 Component restraints. Doors, drawers, and other moving parts of the storage media shall be provided with restraints as necessary to secure them in the open and closed positions. The

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restraints shall prevent unintended movement of the moving parts due to transport (see paragraph 3.6). Items stored in the SATS shall be provided with restraints to secure them in place. The restraints shall prevent the stored items from being dislodged during transport (see paragraph 3.6).

3.5.4 Stairs, ladders, and ramps. The contractor shall provide a safe means of entry and exit for the container in both trailer-mounted and dismounted modes. Because the mission of the SATS inherently requires hand-carrying loads of tools, equipment, and other items into and out of the container, neither ladders nor stair-ladders shall be used to provide access to the container.

3.5.5 Tread surfaces. Stair treads, ramps, and floors shall be provided with open grates or other easily cleaned features to deal with accumulations of tracked mud and snow.

3.5.6 Anti-Entrapment Measures. The container will have anti-entrapment measures to prevent personnel from being locked inside, i.e. an escape hatch that can be opened only from the inside, or a locking and latching mechanism on the door that permits a locked door to be opened from the inside. Modifications to the container attendant to the installation of SATS components shall neither alter nor interfere with the operation of these features.

3.6 Transportability. The Class I Level 1, Class II Level 1, and Class III Level 1 SATS, both trailer-mounted and dismounted, shall be suitable for commercial and military shipment via sea, rail, and highway. The trailer and container shall each be suitable for commercial and military transport by air.

3.6.1 Shock and vibration. The fully loaded SATS container and the trailer, whether shipped separately or as a combined unit, shall withstand the shocks and vibration associated with commercial shipment as secured cargo without sustaining damage or degradation in performance. During or following shipment, there shall be no damage to or displacement of any component, accessory, part, or tool installed in or on the shop, and no evidence of damage to the container or trailer.

3.6.2 Rail transport. In rail transport mode Class I Level 1, Class II Level 1, and Class III Level 1 SATS shall withstand, without damage to or displacement of any stored component or damage to the container, the shock and vibration imparted by coupling rail cars at impact speeds up to 8 miles per hour (mph).

3.6.3 Air transport. The SATS container shall be suitable for transport by the U.S. Air Force C130 and larger cargo aircraft and for external airlift by helicopter. The container will be provided with a vent to prevent damage due to emergency decompression of the aircraft. Modifications to the container attendant to the installation of SATS components shall neither alter nor interfere with the operation of this feature, and the vent shall not be blocked. The center of balance of the loaded SATS container shall be marked on the container exterior in accordance with MIL-STD-129.

3.6.4 Military ground transport. The fully loaded trailer-mounted SATS shall be suitable for transport by Army M1083 tactical cargo trucks as a towed package.

3.6.4.1 Weight. The weight of the complete Class III, Level 1 SATS when fully loaded and prepared for ground transport shall not cause the container to exceed its Gross Weight rating of

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15,000 lbs, and shall not cause the trailer to exceed its Combined Weight Rating (CWR) or the weight rating for any of its axles. The weight of the tools in the Component Lists is subject to variation, depending on the specific items procured; the approximate total weights without the storage media (see 3.3.2.4.2) are 2,500 pounds for the Core Set, 2,400 pounds for Module 1, and 1,100 pounds for Module 2.

Trailer Capacity

Vehicle	Max Trailer CWR	Payload	Weight Rating, Each Axle
XCK2000	21,000 lb	15,000 lb	12,000 lb

3.6.4.2 Balance. When prepared for transport, the weight of SATS trailer-mounted container shall be properly balanced. The center of gravity (CG) shall be within 6 inches of the longitudinal centerline of the shop container and so located that, when trailer-mounted, the lunette/pintle load is not less than 1,050 lbs and not more than 2,100 lbs. The CG of the loaded SATS trailer-mounted container in transport mode shall be at a height producing a trailer Static Stability Factor (one-half the track width divided by the height of the CG) of at least 0.75.

Vehicle Towing Capacity

Vehicle	Max Trailer GVW	Max Pintle Weight	Pintle Height
M1083	21,000	2,100	36"

3.6.4.3 Ground Mobility. When loaded with the tools and equipment specified herein the SATS shall have the durability to withstand being transported over a variety of surfaces including 30% on primary roads, 65% on secondary roads, and 5% on open cross-country. The surfaces traversed shall include various states of disrepair that may be encountered worldwide, including bumps, cobblestone, and washboard. During or following the travel, there shall be no damage to, or displacement of, any component, accessory, part, or tool installed in or on the shop and no evidence of damage to the container. Maximum safe speed for the surface and conditions shall be maintained; not to exceed 50 mph on primary roads, 35 mph on secondary roads, and 15 mph for travel cross-country.

3.7 Economic life. The SATS shall have a projected economic life of not less than fifteen years under the service conditions described herein.

3.8 Reliability/Maintainability. The design of the SATS shall provide a Mission Capable Status rate of 90% with 80% confidence.

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3.9 Ease of maintenance.

3.9.1 Access. It shall be possible for the majority of Army personnel to perform preventative maintenance on the SATS container without removing or disassembling any part of the storage media (see Appendix D).

3.9.2 Fastening devices. Screws, pins, bolts, and similar parts shall be installed with means for preventing loss of tightness. The methods for preventing loss of tightness shall be according to accepted engineering standards and practices. No such parts subject to removal or adjustment shall be swaged, staked, or otherwise deformed.

3.9.3 Cleaning. The container is required to be washable inside and out. Any features within the container that could become collection points for water are required to be provided with drains. The drains shall not be blocked.

4 VERIFICATION

4.1 General provisions. The inspections (examinations and tests) herein shall be performed to determine whether the item conforms to Section 3 of this specification. If the contractor supplies a trailer that has not been adopted as an Army standard tactical trailer and/or a container that has not been adopted as an Army standard item, the inspections of Appendix E and Appendix F, respectively, shall also be performed.

4.1.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

4.1.2 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified herein.



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**TABLE I. Requirement/verification matrix**

<div style="display: flex; justify-content: space-between;"> <div> <u>Verification Methods</u>  N - Not Applicable  1 - Analysis  2 - Demonstration  3 - Examination  4 - Test (F = First Article only) </div> <div> <u>Verification Class</u>  A = First Article  B = Conformance </div> </div>									
Title	Section 3 Requirement	Verification Method					Verification Class		Section 4 Requirement
		N	1	2	3	4	A	B	
Tools and related items	3.2.1.4				X		X	X	4.5
Workbenches	3.2.2			X			X		4.5.1
Vise mounts	3.2.3			X			X		4.5.2
Computer Workstation	3.2.4			X			X		4.5.3
Container/vehicle	3.3.1			X			X		4.6.1
GFM modification	3.3.1.1				X		X		4.6.1.1
Size	3.3.1.2				X		X		4.6.1.2
Human interface	3.3.2				X		X		4.6.2
Task loading	3.3.2.1			X			X		4.6.2.1
Illumination level	3.3.2.2			X			X		4.6.2.2
Protective clothing	3.3.2.3			X			X		4.6.2.3
Easy access	3.3.2.4.1			X			X		4.6.2.4.1
Storage media	3.3.3.4.2				X		X		4.6.2.4.2
Organized storage & Visual Cues	3.3.2.4.3 & 3.3.2.4.6				X		X	X	4.6.2.4.3
Proximate storage	3.3.2.4.4				X		X	X	4.6.2.4.4
Linear products	3.3.2.4.5				X		X	X	4.6.2.4.5
Rapid inventory	3.3.2.4.7			X			X		4.6.2.4.6
Plates and labels	3.3.2.5				X		X		4.6.3
Item identification	3.3.2.5.1				X		X	X	4.6.3.1
Shipping data	3.3.2.5.2				X		X	X	4.6.3.2
Hazard identification	3.3.2.5.3				X		X	X	4.6.3.3
Noise hazards	3.3.2.5.3.1					X	X		4.6.3.3.1
Lift hazards	3.3.2.5.3.2				X		X	X	4.6.3.3.2
Warranty Information	3.3.2.5.4				X		X	X	4.6.3.4
Unique Item Identification	3.3.2.5.5				X		X	X	4.6.3.5
Environmental protection	3.4.1				X		X	X	4.7.1
Protective coloration	3.4.2.1				X		X	X	4.7.2.1
Blackout conditions	3.4.2.2				X		X		4.7.2.2

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Nuclear, Biological, and Chemical Contamination Survivability	3.4.2.3		X				X		4.7.2.3
Weather protection	3.4.3					X	X		4.7.2.4
Interior environment	3.4.4			X			X		4.7.2.5
Fungus and moisture	3.4.5			X			X		4.7.2.6
Ozone	3.4.6			X			X		4.7.2.7
Physical hazard control	3.5.1				X		X	X	4.8.1
Physical strain control	3.5.2			X			X		4.8.1.1
Component restraints	3.5.3			X			X		4.8.1.2
Stairs and ladders	3.5.4				X		X	X	4.8.1.3
Tread surfaces	3.5.5				X		X	X	4.8.1.4
Anti-Entrapment Measures	3.5.6				X		X	X	4.8.1.5
Transportability	3.6		X				X		4.9.1
Shock and vibration	3.6.1		X				X		4.9.2
Rail transport	3.6.2					X	X		4.9.3
Air transport	3.6.3			X			X		4.9.4
Military ground transport	3.6.4				X		X		4.9.5
Weight	3.6.4.1				X		X		4.9.5.1
Balance	3.6.4.2			X			X		4.9.5.2
Ground Mobility	3.6.4.3					X	X		4.9.5.3
Economic life	3.7		X				X		4.10
Reliability/Maintainability	3.8		X				X		4.11
Access	3.9.1			X			X		4.12.1
Fastening devices	3.9.2				X		X	X	4.12.2
Cleaning	3.9.3				X		X	X	4.12.3

#### 4.2 First article inspection.

4.2.1 Submission. The contractor shall submit a first article sample as designated by the Contracting Officer for evaluation in accordance with the specified verification methods of Table I. The first article inspection shall consist of a minimum of one complete Class III Level 1 SATS.

4.2.2 Inspections to be performed. As determined by the Government, the first article assemblies, components and test specimens may be subjected to any or all of the verification methods specified (see Table I). Unless otherwise specified all the inspections shall be performed.

4.2.3 Rejection. If any test assemblies, test specimen or test components fails to comply with any of the applicable requirements, the first article sample shall be rejected. The Government reserves the right to terminate inspection upon any failure of a test assembly, specimen or

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component to comply with any of the requirements.

**4.3 Conformance inspection.**

**4.3.1 Compliance.** Conformance inspections shall be applied to production units being offered for acceptance under the contract. These inspections shall include all verifications listed in Table I.

**4.3.2 Inspection lot formation.** Lot formation shall be in accordance with Section 4 of MIL-STD-1916.

**4.3.3 Sampling plan determination.** Conformance verification methods are specified in Table I. When required by contract or cited herein, attribute sampling inspections shall be conducted in accordance with MIL-STD-1916 using verification level I.

**4.3.4 Rejection.** Failure of any unit to pass any verification shall be cause for rejection of the unit.

**4.4 Preparation.** Prepare the SATS for testing by performing normal service, lubrication, and adjustment of the SATS components, container, and trailer as recommended by the manufacturer.

**4.5 Tools and related items.** Verify that the SATS tools, machinery, and related supplies as specified in the Component List (Appendices A, B, and C, as applicable) are present and are of industrial or professional grade. Verify that the Core Set and Modules are physically and visually segregated for storage and transport as required.

**4.5.1 Workbenches.** Verify workbenches are provided with the SATS container. Measure the work surface dimensions and distance from ground level. The surface shall not be less than 30 inches wide and 16 inches deep. The work surface shall be  $39 \pm 3$  inches from ground level with the container trailer-mounted in operational mode and with the container dismounted. With a 20-oz striking hammer, apply several impacts, typical of repair shop operation, to various areas of the work surface. The work surface may be dimpled or dented, but shall have no chipping or fractures as a result of the hammer blows. Place a minimum dead weight of 250 pounds on the workbench surface and let it rest at least two (2) minutes. Move the dead weight to not less than 3 other positions on the surface. The dead weight shall not cover a surface area greater than 120 square inches at any time. There shall be no visible permanent deformation to the workbench or container upon completion of the test. Verify that a mount for the bench-mount grinders in Appendices A and C is provided on one end of each workbench. Verify that the grinders can be dismounted, and have dedicated storage locations within the container. Verify that dedicated storage locations are provided for the workbenches as well.

**4.5.2 Vise mounts.** Verify that the vises are removable from their storage locations and mount in the operational positions provided. Confirm that the vises can be adjusted without obstruction throughout the full range of motion provided by their designs. In the jaws of the machinist's vise, fasten a rod that is at least four (4) feet in length perpendicular to the workbench surface, and verify there is at least one position where no vertical obstruction exists. A minimal 45-pound test weight shall be clamped in the jaws of the machinist's vice, and attach a standard torque wrench. Apply a 100 foot-pound torque to the test weight, first clockwise then counterclockwise, in

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planes that are parallel to and perpendicular to the horizontal centerline of the SATS. Examine the vise support for instability, insufficient rigidity, and visible permanent deformation. Evidence thereof shall be cause for rejection.

4.5.3 Computer Workstation. Verify that the Core SATS is supplied with a cabinet-mounted computer workstation with secure storage space for a desktop personal computer with monitor, keyboard, and printer at a height suitable for access by a standing operator, storage space for a box of printer paper, and a segmented rack with storage space for 50 CD Jewel Cases. Verify that the workstation is designed for the operator to use the computer while standing. Verify that the workstation is permanently installed in the container, and is provided with electrical outlets connected to the container electrical system, and data port(s) connected to the container communications pass-through panel.

4.6 Interfaces.

4.6.1 Container/vehicle. Verify that the SATS units are installed in trailer-mounted containers meeting ANSI and ISO standards, and that the storage configuration does not require that any SATS components or tools be transported in the MTV cargo bed or on another vehicle.

4.6.1.1 GFM modification. Verify that permanent documentation exists for any contractor-made vehicle or container modifications.

4.6.1.2 Size. Verify that the overall width of the SATS when transported does not exceed 96 inches, and that no part mounted to the container extends beyond the planes defined by the outer surfaces of the container corner blocks.

4.6.2 Human interface. Verify the SATS complies with the guidelines of Appendix D, and that its equipment and machinery are easily accessible and operable

4.6.2.1 Task loading. Demonstrate that the SATS can be readily set up for operation by two persons in one hour or less. When finished, demonstrate that the same operators can return all equipment to its storage location, and prepare the shop for transport within the same timeframe.

4.6.2.2 Illumination level. With the interior lights of the container turned on and the container door(s) closed, measure the light intensity thirty inches above the container floor with a luminance meter. Confirm there are at least fifty (50) foot-candles of illumination, and that glare and specular reflection are visually tolerable.

4.6.2.3 Protective clothing. Verify the SATS can be set up for operation by troops wearing heavy gloves and winter gear.

4.6.2.4 Storage.

4.6.2.4.1 Easy access. Using operators that meet the anthropometrical requirements of Appendix D, with hands encased in heavy cold weather gloves, demonstrate that all equipment and supplies stored within the SATS are accessible while standing in the container (stooping and bending are permitted). Verify the floor to ceiling/overhead obstruction height inside the container is at least 76 inches.

4.6.2.4.2 Storage media. Verify that the SATS unit has integral storage media suitable for

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stowing all equipment, publications, and expendable supplies during transportation, storage, and periods of non-use. Verify cabinets or other storage media are suitable for use as freestanding units.

4.6.2.4.3 Organized storage & visual cues. Survey each item carried by the SATS unit and verify each has a designated storage location. Also verify that each location has a visible cue when the item is not in storage.

4.6.2.4.4 Proximate storage. Verify that items used together are stored in the same area.

4.6.2.4.5 Linear products. Examine all stored flexible linear products. Confirm that all flexible linear products 10-feet or greater in length are stored on reels or looms, with the exception of the booster cables and the special power cable kits, which shall be stored in coils with the aid of straps or other devices.

4.6.2.4.6 Rapid inventory. With all items in their storage locations, measure the time required to have 1 operator inventory the SATS unit for all its tools, machinery, and related supplies being present and secured in their proper location. The measured time shall not be greater than two hours for the core set and nor more than one hour each for Modules 1 and 2. Any missing item shall be identifiable by name and NSN, or by name, CAGE code, and part number within 1 minute.

4.6.3 Plates and labels. Examine all plates and labels affixed to the SATS unit. Affirm that the US English language is used. Examine all plate and label material specification sheets, including marking, engraving techniques. Verify that they are resistant to all environmental elements and petroleum products and will remain legible for 10 years.

4.6.3.1 SATS identification plate. Locate the SATS unit identification plate. Verify that it is plainly visible on the exterior of the SATS container, and that it contains the information and material requirements of paragraph 3.3.2.5.1.

4.6.3.2 SATS shipping data plate. Locate the SATS unit shipping data plates. Confirm them to be plainly visible on the exterior of the container when the SATS is in transport mode. Verify that they contain the information and material requirements of paragraph 3.3.2.5.2.

4.6.3.3 Hazard identification. In an operational mode, examine the SATS unit for all unguarded physical hazards (see 3.5.1) and verify that all are properly identified and labeled in accordance with ANSI Z535.4.

4.6.3.3.1 Noise hazards. Measure the noise generated by the any noise generating components of the SATS unit while being operated in a free field using the A scale at slow response on a sound level meter meeting the Type I requirements of ASA S1.4. Establish a steady state 85 dB (A) contour surrounding the compressor by measuring at least 8 locations, at a height of 5 feet above the ground plane at angular increments of not more than 45 degrees from the noise source. The maximum distance at which 85 dB (A) is obtained shall be indicated on a noise hazard caution sign posted on the component.

4.6.3.3.2 Lift hazards. Verify that caution signs are placed on all stored items exceeding the Design Weight Limits of Appendix D.

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4.6.3.4 Warranty information. Locate the SATS unit warranty information label. Verify that it is plainly visible on or near the personnel door of the SATS container, and that it contains the information requirements of paragraph 3.3.2.5.4.

4.6.3.5 Unique Item Identifier. Locate the SATS Unique Item Identifier. Verify that it is plainly visible on the exterior of the SATS container, and that it conforms to the requirements of the contract, MIL-STD-130, and other requirements of paragraph 3.3.2.5.5.

4.7 Environment.

4.7.1 Environmental protection. Verify the SATS unit includes spill containment equipment and supplies compatible with coolant, fuel, solvent, petroleum, oils, and lubricants, and rated for containing a spill equal to the volume of the largest liquid container in the SATS unit.

4.7.2 Battlefield survivability.

4.7.2.1 Protective coloration. Confirm that all metal parts added to the SATS trailer and the container exterior have a protective finish in accordance with MIL-STD-171, finish 7.3.1 plus 20.24 (CARC) for aluminum and finish 5.1.1 plus 20.24 for ferrous metals and is compatible with the camouflage pattern (if approved).

4.7.2.2 Blackout conditions. With the SATS unit in its operational configuration, the personnel entryway(s) closed and the interior lights on, visually verify the container is light tight. No light generated when the interior lights of the container are illuminated may be visible from any point outside the container when the container is surrounded by darkness in a lightless room. Verify the personnel entryway interlock is functional.

4.7.2.3 Nuclear, Biological, and Chemical Contamination Survivability. Verify that modifications to the trailer and the exterior of the SATS container have not diminished their ability to be decontaminated. Documentation shall consist of an analysis from Dugway Proving Ground.

4.7.2.4 Weather protection. Verify that modifications to the container have not degraded its ability to protect its contents from weather. The SATS shall be tested in accordance with MIL-STD-810, Method 506, Procedure II with a nozzle pressure of 40 psig (276 kPa) and a duration of at least 40 minutes. During the test, all items shall be in their storage locations and all doors and panels shall be closed and locked. Immediately following the test open all doors and panels and examine for any evidence of water. Water in any cavity of the container shall be cause for rejection.

4.7.2.5 Interior environment. Verify that GFM environmental control unit(s) (heater and air conditioner) has been installed in working order.

4.7.2.6 Fungus and moisture. Examine the material specifications all materials used in the SATS and verify that all hoses, cable covers and other elastomer parts are fungi and moisture resistant.

4.7.2.7 Ozone. Examine the material specifications of all hoses, electric cable covers, and other elastomer parts exposed to the atmosphere. Verify that all materials used in the SATS are ozone resistant.

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**4.8 Safety.**

**4.8.1 Physical hazard control.** Examine the SATS unit and confirm all moving parts, electrically energized parts, and high temperature surfaces are provided with guards, covers, or insulation to protect personnel from inadvertent contact. Also, confirm that safety guards, covers, and insulation, do not interfere with the operation of the SATS. Verify that any physical hazard that cannot use protective devices is identified, by type, with a plainly visible warning sign.

**4.8.1.1 Physical strain control.** Verify the physical exertion required when setting up the SATS unit for operation in the field, and when preparing it for ground transport does not exceed safe limits for the target population (see Appendix D).

**4.8.1.2 Component restraints.** Verify that all doors, drawers, and other moving parts of the storage system are provided with restraints.

**4.8.1.3 Stairs and ladders.** Verify that neither ladders nor stair-ladders are used to provide access to the container. Verify that any stairs or ramps incorporated in the container design conform to the guidelines of Appendix D.

**4.8.1.4 Tread surfaces.** Verify the container floor, ramp, stair treads, and other walking surfaces have non-slip surfaces. Verify that stair treads, ramps, and floors have open grating or other easily cleaned features to deal with accumulations of tracked mud and snow.

**4.8.1.5 Anti-Entrapment Measures.** Verify that the anti-entrapment measures of the container have not been rendered inaccessible or inoperable.

**4.9 Transportability.**

**4.9.1 Commercial transport.** Provide an analysis showing that the SATS in its transport mode is suitable for commercial shipping via air, sea, or highway.

**4.9.2 Shock and vibration.** Provide an analysis showing that the SATS withstands the shocks and vibration associated with commercial shipment as secured cargo without sustaining damage or degradation in performance. The analysis shall also state that during or following shipment, no damage to or displacement of any component, accessory, part, or tool installed in or on the shop, and no evidence of damage to the shop container mounting points.

**4.9.3 Rail transport.** The trailer-mounted SATS shall be tested in accordance with MIL-STD-810, Method 516.5, Procedure VII - Rail Impact. The SATS shall be in transport configuration for the test, with all items in their storage locations and all doors and drawers closed and locked. Binding of any door or drawer; dislodgment of or damage to any stored item; or damage to any part of the container shall be cause for rejection.

**4.9.4 Military air transport.** Verify that the SATS container and trailer are suitable for transport by the U.S. Air Force C130 and larger cargo aircraft and for external airlift by helicopter. Verify that the container decompression vent has not been blocked or rendered inoperable. Verify that the center of balance of the SATS container in transport mode is marked on the container exterior in accordance with MIL-STD-129.

**4.9.5 Military ground transport.** Verify that the SATS is suitable for transport by M1083

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tactical cargo trucks as a towed package by performing the tests specified in Appendix E.

4.9.5.1 Weight. Weigh the complete Class III Level 1 SATS container and trailer when fully loaded and prepared for ground transport. Verify that it does not exceed the M1083 towing capacity of 21,000 lbs or the weight rating for any trailer axle when configured for military deployment.

4.9.5.2 Balance. Verify that the weight of SATS is properly balanced in its container and that the CG of the SATS is at a height producing a Static Stability Factor of 0.75 or more.

4.9.5.3 Ground Mobility. Transport the SATS over a mission/field support test track that simulates in-service conditions as follows: not more than 6000 miles on a Secondary Road course of native soil composition, 500 miles on a moderately rough Cross Country course of native loam with quarry spall composition and 50 miles on a Belgian Block course. In addition, 5 laps around a segmented Road Shock and Vibration Course consisting of 2-inch Washboard, 2 to 4 inch Radial Washboard, 3-inch Spaced Bump and a 6-inch Washboard shall be required. Maximum safe speed for the surface and conditions shall be maintained; not to exceed 35 mph on secondary roads, 15 mph for travel cross-country, and 15 mph for Belgian Block course. Speeds for the Road Shock and Vibration course shall vary between 2-10 mph. Any evidence of damage to the container, including loose or missing fasteners, any damage to, or displacement of, any component, accessory, part, or tool installed in or on the SATS, or the failure of any item of equipment in the SATS to function properly upon completion of the test shall be cause for rejection.

4.10 Economic life. The contractor shall provide a report detailing the projected economic life of the SATS is at least fifteen years. The projection may be made based on historical data regarding the economic life of items having similar design and manufacture, test data, or a combination thereof. Lack of supportive objective evidence in the report shall be cause for rejection.

4.11 Reliability/Maintainability. The contractor shall provide an analysis demonstrating 80% confidence the SATS will have a Mission Capable status 90% of the time. The projection may be made based on historical data regarding the reliability and maintainability of items having similar design and manufacture, test data, or a combination thereof. Lack of supportive objective evidence in the report shall be cause for rejection.

4.12 Ease of maintenance.

4.12.1 Access. Using operators meeting the anthropometrical requirements of Appendix D, demonstrate that all routine preventative maintenance tasks can be performed without dismounting the shop from its trailer and without removing or disassembling any part of the storage media.

4.12.2 Fastening devices. Examine all removable fasteners on the SATS and verify that all use some means of keeping tightness and none are staked, swaged, or otherwise deformed.

4.12.3 Cleaning. Within the SATS container locate all points that may become collection points for cleaning fluid and verify each has a drain port.



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**5 PACKAGING**

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order. When actual packaging of materiel is to be performed by DOD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

**6 NOTES**

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The SATS is primarily intended for use by personnel engaged in the maintenance and repair of military equipment while away from fixed maintenance facilities. To maintain continuity of training and practice, the SATS will regularly be used in garrison operations as well.

6.2 Noise limits. The requirement for posting Noise Hazard signs on all equipment generating noise in excess of 85 dB (A) and the requirement for hearing protection support the Army Hearing Conservation Program (see DA PAM 40-501). The Army program requirement is more conservative than the standard OSHA requirement, which sets the threshold criterion at 90 dB (A) for an 8-hour exposure. If technically and economically feasible, it is preferred that the noise level of the SATS not exceed 85 dB (A).

6.3 Trailer lights and reflectors. The lights and reflectors required for military tactical trailers are generally identical to those required by Federal Motor Vehicle Safety Standards (FMVSS), except that the combination tail and stop light assemblies contain blackout lights on a separate circuit.

6.4 Measurement system. The US Customary System of Units (US) or the International System of Units (SI) may be used in construction of the SATS. In this specification, all measurements, dimensions, sizes, and capacities are given in the US system. These measurements may be converted to the SI system by using the conversion factors and methods specified in IEEE/ASTM SI 10.

6.5 Unique Item Identifier. This is a military unique requirement. The requirements contained in this specification are in addition to the requirements of DFARS clause 252.211-7003 incorporated elsewhere in the contract. Further guidance on UIDs may be found at <http://www.acq.osd.mil/dpap/UID/>.

6.6 Definitions.

6.6.1 Displacement. Displacement is dislodgment of any tool or item of equipment from its designated position. Movement of a tool or item of equipment within its designated position without any dislodgment is permitted.

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6.6.2 Fully loaded. The Set is fully loaded when it is completely equipped and ready for operation. In addition to the full compliment of items on the components list, the container encloses the full compliment of expendable supplies, including filled acetylene/propylene and oxygen cylinders. In the opposite (unloaded) condition, all equipment that is normally affixed to the trailer or container when in use remains on the trailer, but the gas cylinders and all other stored items have been removed.

6.6.3 Secured cargo. Secured cargo is cargo that is securely tied or blocked in all three axes with respect to the bed of the transport vehicle.

6.6.4 Primary road. A primary road is a thoroughfare or highway. It is the preferred route between economically and strategically important destinations (usually communities) that carries heavy and high-density traffic. In the United States “primary road” implies a high-speed paved road (see “Surface Types” below).

6.6.5 Secondary road. A secondary road is any road other than a primary road. A secondary road may or may not be paved, and is intended for medium-weight, low-density traffic. Although many secondary roads in the United States are equal in quality to the primary roads, for the purposes of this specification secondary roads are considered to be trails and aggregate-surfaced roads (see “Surface Types” below).

6.6.6 Surface types. The surface types defined herein refer to those provided at the U.S. Army’s Aberdeen Proving Ground (APG), Aberdeen, Maryland. Because alternate test courses may be utilized, the definitions provided are descriptive in nature and refer to APG test courses considered standard. Also, the illustrations provided show the surface courses only, and do not reflect sub-courses or roadbed preparation. It should be noted that road types, grades, and methods of construction cover a broad spectrum, and it is not practical to replicate or test for every conceivable surface type.

6.6.6.1 High-speed paved road. Commonly known as a highway. The surface is paved with bituminous concrete (also variously known as blacktop, asphalt, tarmac, or macadam) or Portland cement concrete. This is a hard, smooth, level, crowned road with gradual turns and clear lines of sight that permit vehicle operation at high speed. Recommended and generally accepted construction materials and methods vary depending on soil conditions, climate, and expected traffic burden. These roads have two or more lanes with a minimum width of nine feet each and a crown to 2 degrees. This surface type is represented at APG by the Perryman Test Area’s Three Mile Straight-away, which has paved turnarounds at each end to permit continuous high-speed travel. In the United States, most primary and many secondary roads are high-speed paved roads.

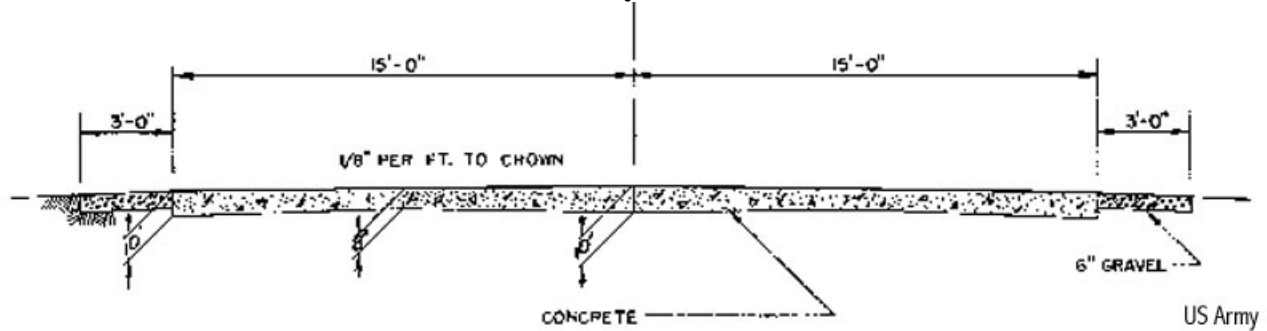


Figure 1. Transverse Section of High Speed Paved Road

6.6.6.2 Aggregate-surfaced road. An aggregate surface road is commonly known as a gravel road. The surface is paved with compacted aggregate consisting of gravel or crushed stone, and has a crown maintained by grading. It is a smooth, level road that permits vehicle operation at moderately high speed. The road bed is usually prepared by grading and compaction. (Roads of this type were originally called macadam roads after their inventor, John Macadam. Improvement on this construction by the addition of tar or asphalt as a binder has resulted in some blurring of this distinction in common usage – see “High-speed Paved Road,” above.) These roads have two lanes with a minimum width of eight feet each. This surface type is represented at APG by the Munson Test Area’s Improved Gravel Road course. In the United States, most gravel roads are secondary roads. Aggregate-surfaced roads are the preferred method for construction of temporary roads by the Army Corps of Engineers in a theater of operations.

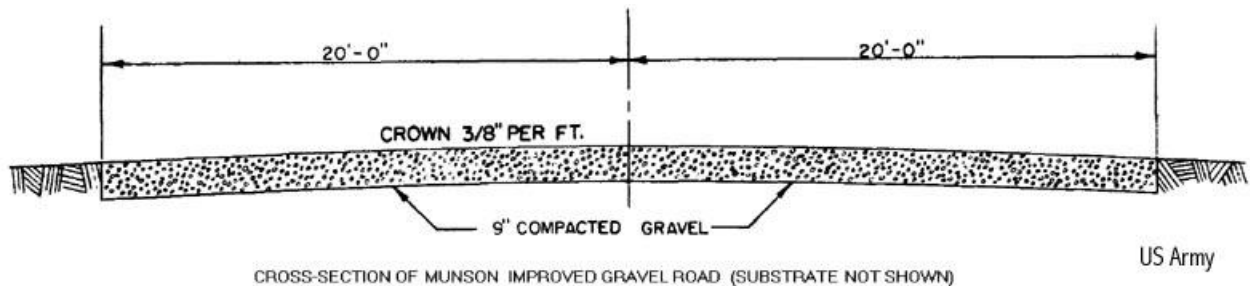


Figure 2. Transverse Section of Aggregate-surfaced Road

6.6.6.3 Trail. Trails are commonly known as a dirt or country roads. The surface is unpaved and consists of native soil or gravel. It is a rough road that permits vehicle operation at moderately low speed. The road is prepared and maintained by grading, and by filling ruts and potholes with native soil, gravel, or crushed stone. In the United States, all unpaved roads are secondary roads. This is the preferred method for construction of expedient roads by the Army

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Corps of Engineers in a theater of operations. Trails are represented at APG by the Perryman Test Area's Secondary Roads A (light to smooth) and B (moderately severe), and the Churchville Test Area's Course C (smooth but hilly). Churchville Course C is primarily reserved for testing wheeled vehicle test items, particularly trailers.

6.6.6.4 Open cross-country terrain. No road. The surface traversed is free of major obstacles such as trees, brush, large rocks, gullies and ditches. It consists of unimproved open fields, broken ground, or loose sand and gravel. It is a rough surface that permits vehicle operation only at low speed. It is represented at APG by the Churchville Test Area's Courses A and B, and the Perryman Test Area's Courses One through Four. Perryman Course One is the least severe. It has a roughness of 0.4 inches RMS, and is primarily reserved for testing wheeled vehicle systems.

6.6.6.5 Cobblestone. Cobblestone is a surface paved with unevenly laid stones forming a rough, undulating surface. Although an obsolete method of road construction dating back to ancient times, cobblestone roads are still found in many parts of the world. They are represented at APG by the Munson Test Area's Belgian Block course, which has a roughness varying from 0.82 to 0.87 inches RMS.

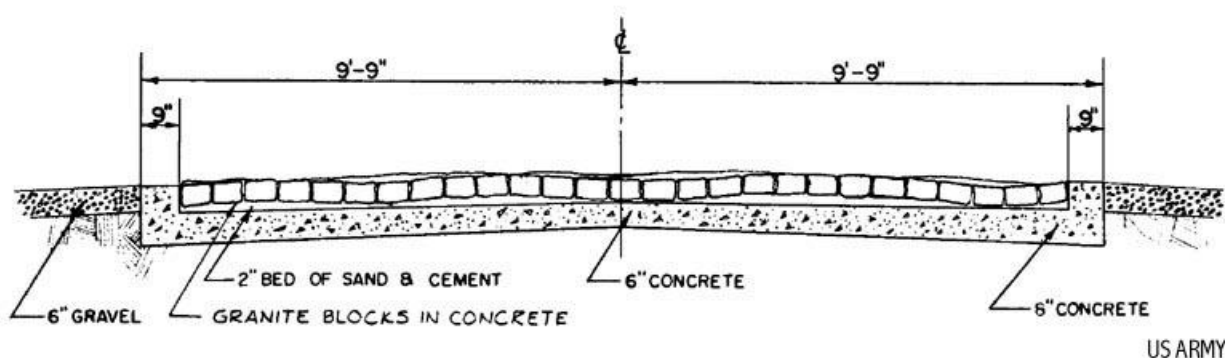
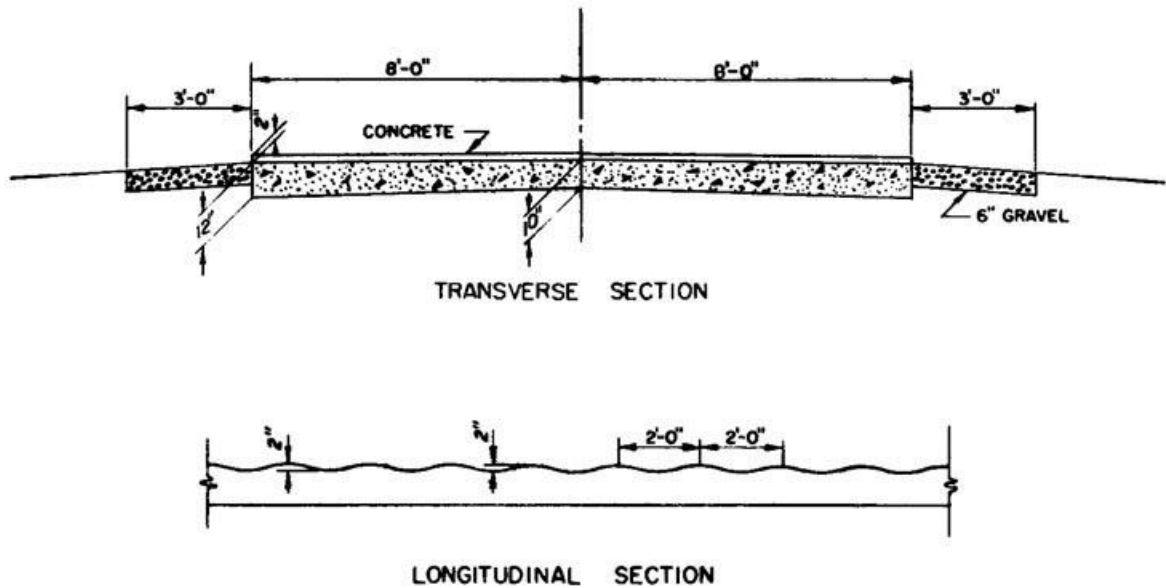


Figure 3. Transverse Section of Munson Belgian Block Course at APG

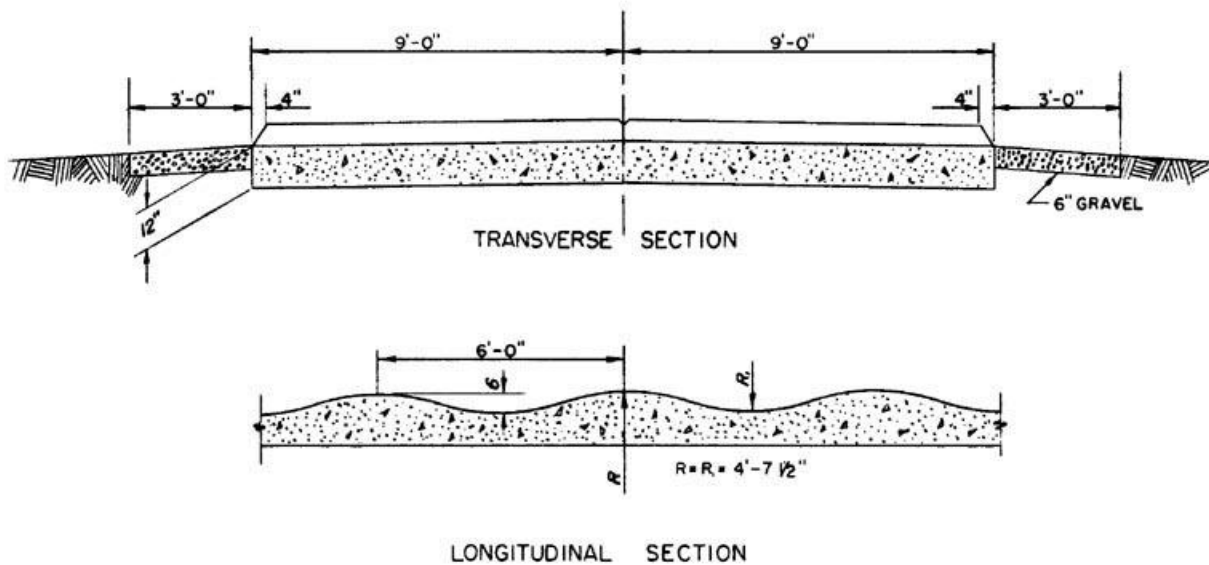
6.6.6.6 Washboard. Washboard is a corrugated surface formed in dirt or gravel roads by very heavy vehicle traffic. This surface is represented at APG by the Munson Test Area's 2-Inch Washboard, 6-Inch Washboard, and 2-to-4-Inch Radial Washboard courses.

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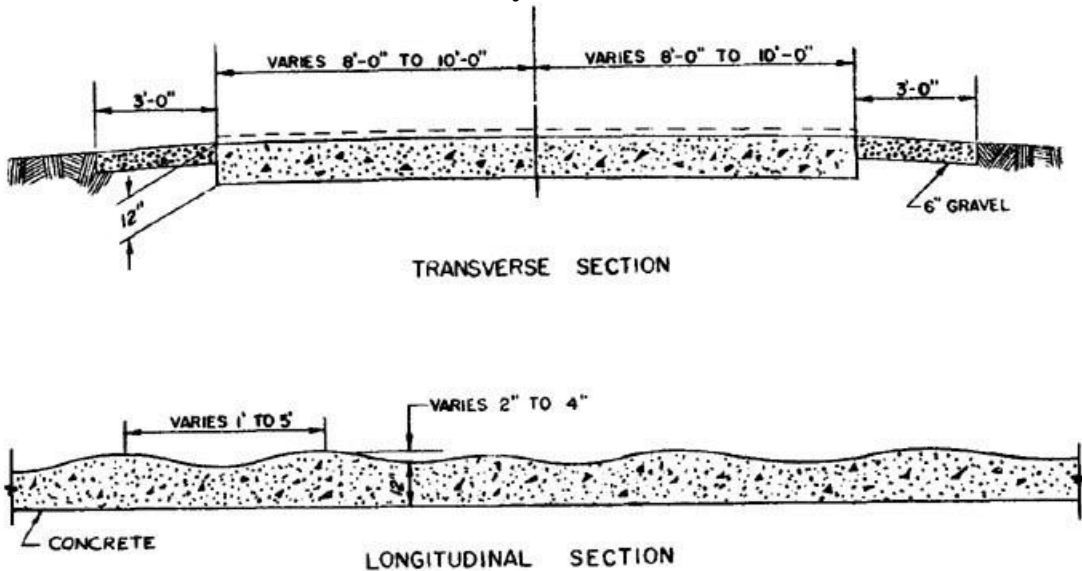
US ARMY

Figure 4. Section Views of Munson 2-Inch Washboard Course at APG



US ARMY

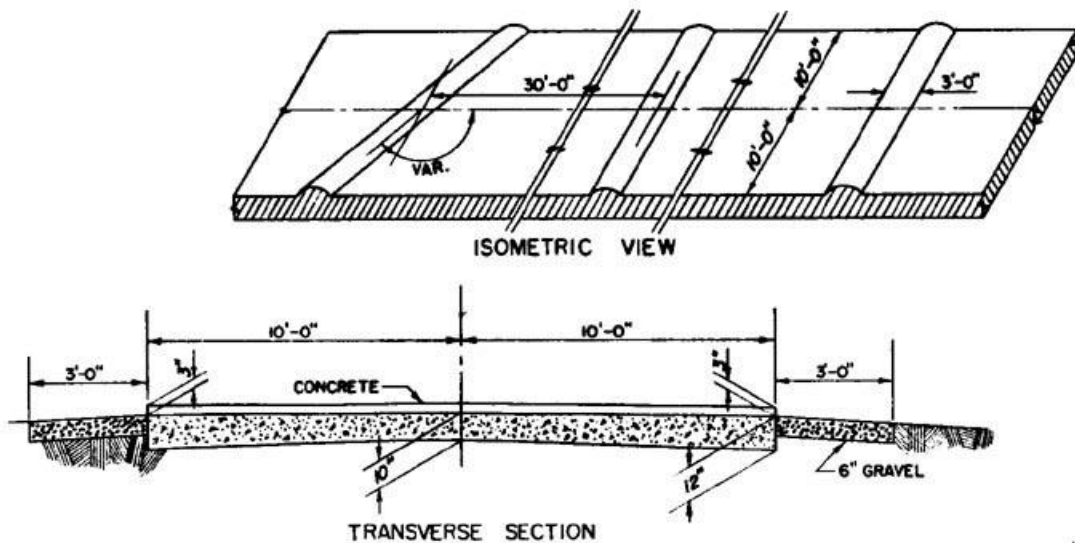
Figure 5. Section Views of Munson 6-Inch Washboard Course at APG



US ARMY

Figure 6. Section Views of the Munson Radial Washboard Course at APG

6.6.6.7 Bumps. Bumps are surface discontinuities such as may be formed by buckled concrete, speed bumps, railroad tracks, bridge deck edges, or other features that are isolated enough to allow the vehicle suspension to “settle down” between jolts. This surface is represented at APG by the Munson Test Area’s 3-Inch Spaced Bump course.



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Figure 7. Views of Munson Spaced Bump Course at APG

6.6.6.8 Side slope. A side slope is a surface sloping in a direction perpendicular to the direction of travel, so that the vehicle is tilted to one side. This terrain is represented at APG by four courses in the Munson Test Area with slopes of 20, 30, 35, and 40 percent, respectively.

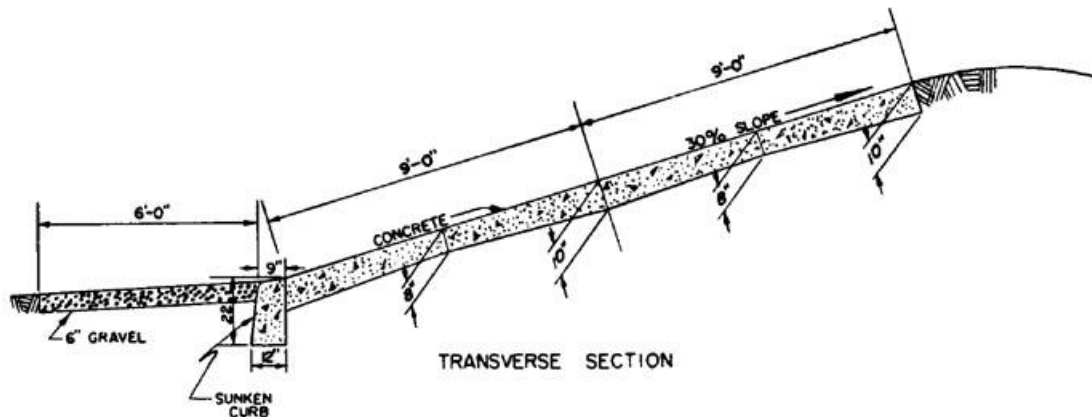


Figure 8. 30% Side Slope

6.6.6.9 RMS. Root Mean Square, which is a mathematical term denoting the square root of the sum of squared deviations from the norm divided by the number of observations in a sample. In the specific case of characterizing the roughness of a towing surface, the surface deviations from level are measured by a profilometer. Using the RMS value provides a neutral method for determining the effective roughness of different surfaces.

6.6.7 Acquisition instrument identification number: The Government acquiring activity's contract or purchase order number.

6.6.8 Part or Identifying Number (PIN): The identifier assigned by the manufacturer, which uniquely identifies the SATS relative to the manufacturer; often a model number or top assembly drawing number.

6.6.9 Commercial and Government Entity (CAGE) Code: a five-character code which is assigned to commercial and Government activities that manufacturer or develop items, or provide services or supplies to the Government. The CAGE was previously called the manufacturer's code, code identification number, or Federal Supply Code for Manufacturers (FSCM).

6.6.10 NATO Supply Code for Manufacturers (NSCM): A five-position alpha-numeric code assigned to manufacturers that are located in a country other than the United States or Canada, and are a source of supply for items acquired by the Federal Government, NATO member nations, and other participating friendly Governments.

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6.6.11 Subject terms (key word) listing.

Environmental  
Roadability  
Set  
Tools and equipment

6.6.12 Acronyms in this specification. The acronyms used in this specification are:

DoD	- Department of Defense
DoDISS	- Department of Defense Index of Specifications and Standards
GVW	- Gross Vehicle Weight
GVWR	- Gross Vehicle Weight Rating
LIN	- Line Item Number
NSN	- National Stock Number

Custodian:  
Army - AL

Preparing Activity:  
Army – AL



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APPENDIX A  
COMPONENT LIST  
SATS CORE TOOLS

For the systems that will be used as Production Representative Systems for testing purposes, all components listed in the following table will be provided and space within the container allocated for each component.

For all future delivery orders components listed with Remarks Code 16 or Remarks Code 22, space will be allocated within the container for each item and that location documented, however, the item itself will not be provided.

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## SATS Core Tool Load

#	NOMENCLATURE	UI	QTY	WTY*	RC**
1	ADAPTER KIT, GREASE GUN COUPLING	KT	1	C	
2	ADJUSTING TOOL, BRAKE SHOE	EA	1	L	
3	ANALYZER, DIGITAL BATTERY*	EA	1		
4	APRON, UTILITY	EA	1	C	21
5	BAR, PINCH, 26"	EA	2	L	10
6	BAR, PINCH, 36"	EA	1	L	10
7	BAR, WRECKING	EA	1	L	10
8	BATTERY FILLER, GRAVITY	EA	1	C	
9	BATTERY FILLER, SYRINGE	EA	2	C	
10	BATTERY KIT, SERVICE	KT	1	C	
11	BENDER SET, TUBE, HAND ACTUATED	SE	1	N	
12	BLADE, HAND HACKSAW	BD	1	N	21
13	BLADE, ABRASIVE, CUT-OFF	PG	1	N	21
14	BLOW GUN, AIR	EA	2	C	10
15	BOX, TOTE	EA	5		10
16	BRAZING AND SOLDERING SET	EA	1	C	
17	BRUSH, FILE CLEANER	EA	1	C	21
18	BRUSH, WIRE, ROTARY, END ATTACHMENT, SOLID WIRE FILLED	EA	1	N	21
19	BRUSH, WIRE, ROTARY, END ATTACHMENT, CIRCULAR, SIDE FLARE	EA	1	N	21
20	BRUSH, WIRE, SCRATCH	EA	1	N	21
21	CABLE ASSEMBLY, POWER	EA	3	C	10
22	CABLE ASSEMBLY, BOOSTER	EA	2	C	
23	CABLE KIT, SPECIAL POWER	EA	1		10
24	CALIPER, MICROMETER, INSIDE	EA	1	L	25
25	CALIPER, VERNIER	EA	1	L	25
26	CAN, RADIATOR FILLING	EA	2	C	
27	CAPS, VISE JAW	PR	2	N	
28	CHARGER, BATTERY	EA	1	C	
29	CLAMP, C	EA	2	L	
	CLEANING COMPOUND, SOLVENT <b>(NOTE: THIS ITEM FOR PRODUCTION REPRESENTATIVE SYSTEM ONLY)</b>				
30		CN	1		22
31	COMPRESSOR UNIT, RECIPROCATING	EA	1	C	
32	CREEPER, MECHANIC'S	EA	5	C	10
33	CRIMPING TOOL, TERMINAL	EA	1	C	
34	CROWBAR	EA	1	L	10
	CROWFOOT ATTACHMENT SET, SOCKET				
35	WRENCH, FLARE NUT, INCH	SE	1	L	
	CROWFOOT ATTACHMENT SET, SOCKET				
36	WRENCH, FLARE NUT, METRIC	SE	1	L	
37	CUTTING AND FLARING KIT, TUBE	KT	1	C	
38	CUTTER, BOLT, LIGHTWEIGHT, 24"	EA	1	L	
	CUTTER, BOLT, REPLACEMENT HEAD <b>(NOTE: THIS ITEM FOR PRODUCTION REPRESENTATIVE SYSTEM ONLY)</b>				
39		EA	1	N	22

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40	DEGREASER, PORTABLE	EA	1		
41	DIE AND TAP SET, RETHREADING	SE	1	L	
42	DIE AND TAP SET, THREAD	SE	1	L	
43	DRESSER, ABRASIVE WHEEL	EA	2	C	
44	DRILL-DRIVER, BATTERY OPERATED, RECHARGEABLE	EA	2	C	10
45	DRILL- DRIVER, ELECTRIC, 1/2"	EA	1	C	10
46	DRILL, BATTERY OPERATED, RECHARGEABLE, RIGHT ANGLE, 3/8"	EA	2	C	10
47	DRILL, ELECTRIC, PORTABLE, 3/8"	EA	2	C	10
48	DRILL, ELECTRIC, PORTABLE, 1/2"	EA	2	C	10
49	DRILL, PNEUMATIC, RIGHT ANGLE, 3/8"	EA	1	C	
50	DRILL SET, TWIST	SE	1	N	10
51	DRILL SET, TWIST, LEFT HAND	SE	1	N	10
	EXTINGUISHER, FIRE*** <b>(NOTE: THIS ITEM FOR PRODUCTION REPRESENTATIVE SYSTEM ONLY)</b>				
52		EA	2		10,16
53	EXTRACTOR SET, SCREW	SE	1	N	10
54	EXTRACTOR SET, HARDENED SCREW	SE	2	C	10
55	FACE SHIELD, INDUSTRIAL	EA	1	C	10
56	FILE SET, HAND	SE	1	C	
57	FILE SET, THREAD RESTORER	SE	1	C	
58	FILLER AND BLEEDER KIT, BRAKE SYSTEM	KT	1	C	
	FILTER, SOLVENT <b>(NOTE: THIS ITEM FOR PRODUCTION REPRESENTATIVE SYSTEM ONLY)</b>				
59		BX	1	N	22
60	FINGER, MECHANICAL	EA	1	C	
61	FOUNTAIN, EYE AND FACE	EA	1	C	
62	FUNNEL	EA	1	N	
63	FUNNEL, FLEXIBLE SPOUT	EA	1	N	
64	GAGE, BOLT AND THREAD, METRIC	EA	2	L	
65	GAGE, BOLT AND THREAD, STANDARD	EA	2	L	
66	GAGE, WHEEL ALIGNMENT	EA	1	C	
67	GLOVES, RUBBER, INDUSTRIAL	PR	1	N	21
68	GOGGLES, INDUSTRIAL	PR	2	N	10
69	GREASE GUN KIT	KT	2	C	
70	GREASE GUN, PNEUMATIC	EA	1	C	10
71	GRINDING MACHINE, UTILITY	EA	2	C	10
72	GUN, FLUID, DIRECT DELIVERY	EA	2	C	
73	HAMMER, HAND, CARPENTER'S, CURVED CLAW, 16 OZ	EA	2	C	
74	HAMMER, HAND, SOFT FACE, DEAD BLOW, 52 OZ	EA	2	C	
75	HAMMER, HAND, SOFT FACE, DEAD BLOW, 10 OZ	EA	2	C	
76	HAMMER, SLEDGE, DOUBLE FACED, 10 LB	EA	2	C	
77	HAMMER, HAND, DEAD BLOW, BALL PEEN, 40 OZ	EA	2	C	
78	HAMMER SET, HOLDER AND INSERTS	SE	1	C	
79	HAMMER, PNEUMATIC	EA	1	C	
80	HOLDER, PUNCH AND CHISEL	EA	2	C	10
81	HOSE ASSEMBLY, AIR, NON-METALLIC	EA	2	C	10

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82	INDICATOR, DIAL	SE	1	C	
	INFLATOR-GAGE AND HOSE ASSEMBLY,				
83	PNEUMATIC TIRE	EA	2	C	
84	JACK KIT, HYDRAULIC, HAND	KT	1	C	
85	JACK, BOTTLE, HYDRAULIC, HAND, 12 TON	EA	2	C	10
86	KEY SET, HEX, INCH	SE	1	L	
87	KEY SET, HEX, METRIC	SE	1	L	
	LAMP, FLUORESCENT <b>(NOTE: THIS ITEM FOR PRODUCTION REPRESENTATIVE SYSTEM ONLY)</b>				
88		EA	1	N	22
89	LIFT, TRANSMISSION AND DIFFERENTIAL	EA	1	C	
	LIGHT, BATTERY OPERATED,				
90	RECHARGEABLE	EA	2	C	
91	LIGHT, EXTENSION, FLUORESCENT	EA	2	C	10
	LIGHT, EXTENSION, LED <b>(NOTE: THIS ITEM FOR PRODUCTION REPRESENTATIVE SYSTEM ONLY)</b>				
92		EA	1	N	22
93	LUBRICATING GUN, HAND	EA	3	C	10
	LUBRICATING GUN, BATTERY OPERATED,				
94	RECHARGEABLE	EA	1	C	10
95	MEASURE, LIQUID, 8 QUART	EA	1	C	10
96	MEASURE, LIQUID, 2 QUART	EA	1	C	10
97	MULTIMETER	EA	3	C	10
98	MULTIPLIER, TORQUE	EA	1	L	
99	OILER, HAND	EA	2	C	10
100	PAN, DRAIN	EA	2	C	10
101	PLATE, BOLSTER, 24" x 24"	EA	2	N	10
102	PLATE, BOLSTER, 40" x 72"	EA	1	N	10
103	PLIERS, LOCK RING	EA	1	L	
104	PLIERS, LOCK RING	EA	1	L	
105	PLIERS SET, RETAINING RING	SE	2	L	10
106	PLIERS, BRAKE REPAIR, HEAVY	EA	1	L	
107	PLIERS, BRAKE REPAIR, LIGHT	EA	1	L	
108	PLIERS, WIRE TWISTER	EA	1	L	
109	PNEUMATIC BAG KIT, LIFTING	KT	1	C	10
	PROPANE FUEL CYLINDER *** <b>(NOTE: THIS ITEM FOR PRODUCTION REPRESENTATIVE SYSTEM ONLY)</b>				
110		EA			16,22
111	PULLER SET, MECHANICAL	SE	2	L	
112	PUMP, LUBRICANT	EA	1	C	
113	PULLER, MECHANICAL, STEERING WHEEL	EA	1	L	
114	PULLER, MECHANICAL, PITMAN ARM	EA	1	L	
115	PUNCH & CHISEL SET	SE	2	N	10
116	PUNCH SET, CUTTING, GASKET	SE	1	N	
117	SANDER/GRINDER, 4 1/2"	EA	1	C	
118	SAW, HAND, CROSSCUT	EA	1	C	
119	SAW, HAND, METAL CUTTING	EA	2	C	10
120	SAW, HAND, METAL CUTTING	EA	2	C	10
121	SCALE, WEIGHING	EA	1	C	
122	SCRAPER, GASKET	EA	2	L	
123	SCREWDRIVER ATTACHMENT SET, TORX	SE	2	L	
124	SCREWDRIVER ATTACHMENT SET, INCH	SE	1	L	

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	HEX				
	SCREWDRIVER ATTACHMENT SET, METRIC				
125	HEX	SE	1	L	
126	SCREWDRIVER SET, JEWELER'S	SE	1	L	
127	SCREWDRIVER SET	SE	1	L	
128	SCREWDRIVER SET, TORX	SE	1	L	
129	SHARPENER, DRILL, PORTABLE	EA	1	C	
130	SHEARS, BENT, TRIMMER	EA	1	C	
131	SLING, ENGINE AND TRANSMISSION, 3 TON	EA	1	C	
132	SLING, ENGINE AND TRANSMISSION, 2 TON	EA	2	C	10
	SOCKET SET, SOCKET WRENCH, 3/8" DRIVE,				
133	METRIC, UNIVERSAL	SE	1	L	
	SOCKET SET, SOCKET WRENCH, 3/8" DRIVE,				
134	INCH, UNIVERSAL	SE	1	L	
	SOCKET SET, SOCKET WRENCH, 3/4" DRIVE,				
135	INCH, REGULAR LENGTH	SE	1	L	
	SOCKET SET, IMPACT WRENCH, 1/2" DRIVE,				
136	METRIC, UNIVERSAL	SE	1	L	
	SOCKET SET, IMPACT WRENCH, 1/2" DRIVE,				
137	INCH UNIVERSAL	SE	1	L	
	SOCKET SET, IMPACT WRENCH, 3/4" DRIVE,				
138	INCH, REGULAR LENGTH	SE	1	N	
	SOCKET SET, MASTER, SOCKET WRENCH,				
139	1/4", 3/8" AND 1/2" DRIVE	SE	1	L	
	SOCKET SET, SOCKET WRENCH, WHEEL				
140	BEARING LOCKNUT	SE	1	L	
	SOCKET SET, IMPACT WRENCH, 3/4" DRIVE,				
141	METRIC, REGULAR LENGTH	SE	1	N	
142	SOLDERING GUN	EA	1	C	
143	SPLITTING TOOL, NUT	EA	1	L	
144	TAPE, MEASURING, 25'	EA	1	C	10
145	TEST KIT, RADIATOR PRESSURE	KT	1	C	
146	TESTER, ANTIFREEZE SOLUTION	EA	2	C	10
147	TOOL KIT, BLIND FASTENER INSTALLATION	KT	1	C	
148	TOOL KIT, CUTTING, ABRASIVE, PNEUMATIC	KT	1	C	
149	TOOL KIT, LARGE HOSE END CRIMPING	KT	1	C	
150	TOOL KIT, SMALL HOSE END CRIMPING	KT	1	C	
151	TOOL KIT, SCREW INSERT	KT	1	N	
152	TOOL KIT, TIRE SERVICE	KT	1	C	
153	TRESTLE, HOIST, PORTABLE, 7 TON	PR	4		10
154	TRUCK, LIFT, WHEEL	EA	1		
155	WISE, MACHINIST'S, 4 INCH	EA	1	L	10
156	WISE, PIPE, CHAIN STYLE	EA	1	C	
	WHEEL, ABRASIVE, FINE GRIT (NOTE: THIS				
	ITEM FOR PRODUCTION REPRESENTATIVE				
157	SYSTEM ONLY)	EA	2	N	22
	WHEEL, ABRASIVE, COARSE GRIT (NOTE:				
	THIS ITEM FOR PRODUCTION				
158	REPRESENTATIVE SYSTEM ONLY)	EA	2	N	22
	WHEEL, ABRASIVE, TYPE 27 (NOTE: THIS				
	ITEM FOR PRODUCTION REPRESENTATIVE				
159	SYSTEM ONLY)	PG	1	N	22

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	WHEEL, ABRASIVE, TYPE 29 <b>(NOTE: THIS ITEM FOR PRODUCTION REPRESENTATIVE SYSTEM ONLY)</b>	PG	1	N	22
160	WRENCH, IMPACT, ELECTRIC, ¾" SQUARE DRIVE, 400 FT-LB	EA	1	C	
161	WRENCH SET, FLARE NUT, INCH	SE	1	L	
162	WRENCH SET, BOX, INCH	SE	1	L	
163	WRENCH SET, BOX, METRIC	SE	1	L	
164	WRENCH SET, COMBINATION, INCH	SE	1	L	
165	WRENCH SET, COMBINATION, METRIC	SE	2	L	
166	WRENCH SET, OPEN END, METRIC	SE	1	L	
167	WRENCH SET, OPEN END, INCH	SE	1	L	
168	WRENCH SET, FLARE NUT, METRIC	SE	1	L	
169	WRENCH SET, MASTER, IMPACT WRENCH, 3/8" AND ½" DRIVE	SE	2	C	
170	WRENCH SET, IMPACT SOCKET, ¾" DRIVE, INCH, REGULAR LENGTH	SE	1	N	
171	WRENCH, ADJUSTABLE, 18 INCH	EA	2	L	
172	WRENCH, ADJUSTABLE, AUTOMOTIVE, 15 INCH	EA	2	L	
173	WRENCH, ADJUSTABLE, 10 INCH	EA	2	L	
174	WRENCH, ADJUSTABLE, AUTOMOTIVE, 18 INCH	EA	2	L	
175	WRENCH, OIL FILTER	EA	1	L	
176	WRENCH, OIL FILTER, STRAP	EA	2	C	
177	WRENCH, PIPE, 18 INCH	EA	2	L	
178	WRENCH, PIPE, 10 INCH	EA	2	L	
179	WRENCH KIT, RATCHET, PNEUMATIC, 3/8" DRIVE	KT	3	C	10
180	WRENCH, TORQUE, DIAL, ¼" DRIVE, 30 IN-LB	EA	2	C	10,25
181	WRENCH, TORQUE, DIAL, 3/8" DRIVE, 300 IN-LB	EA	2	C	10,25
182	WRENCH, TORQUE, CLICK, RATCHETING, ¾" DRIVE, 600 FT-LB	EA	1	C	10,25
183	WRENCH, TORQUE, CLICK, RATCHETING, 3/8" DRIVE, 75 FT-LB	EA	1	C	10,25
184	WRENCH, TORQUE, CLICK, 1/2" DRIVE, 345 Nm	EA	1	C	10,25
185	WRENCH, TORQUE, CLICK, RATCHETING, ½" DRIVE, 250 FT-LB	EA	1	C	10,25
186	WRENCH, WHEEL STUD NUT, GEARED SOCKET	EA	1	L	10
187	BAR, TORQUE WRENCH:	EA	1	L	
188	DIE SET, METAL STAMPING, HAND, ALPHABETIC	SE	1	N	
189	DIE SET, METAL STAMPING, HAND, ALPHABETIC AND NUMERIC	SE	1	N	
190	GAGE STOCK SET, THICKNESS	SE	3	N	
191	MULTIPLIER, TORQUE, CRANK OPERATED	EA	1	L	
192	PLATE, BOLSTER, 36" x 36"	EA	1	N	10
193	PLIERS, MULTIPLE POSITION	EA	1	L	
194	PLIERS, MULTIPLE POSITION, ELECTRICAL	EA	1	L	

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CONNECTOR					
196	PULLER KIT, UNIVERSAL	KT	1	L	
197	SOCKET SET, SOCKET WRENCH, ¾" DRIVE, INCH	SE	1	L	
198	WRENCH, SET, SOCKET WRENCH, 1" DRIVE, INCH, REGULAR	SE	1	L	
199	WRENCH, PIPE, 36"	EA	2	L	
200	JACK, BOTTLE, HYDRAULIC, HAND, 30-TON	EA	1	C	10
201	Blow Gun, Extended, Air	EA	1	C	
202	Crowfoot Attachment, ½ inch drive, 20 MM	EA	1	L	
203	Crowfoot Attachment, ½ inch drive, 21 MM	EA	1	L	
204	Crowfoot Attachment, ½ inch drive, 22 MM	EA	1	L	
205	Crowfoot Attachment, ½ inch drive, 23 MM	EA	1	L	
206	Crowfoot Attachment, ½ inch drive, 24 MM	EA	1	L	
207	Crowfoot Attachment, ½ inch drive, 25 MM	EA	1	L	
208	Crowfoot Attachment, ½ inch drive, 15/16"	EA	1	L	
209	Crowfoot Attachment, ½ inch drive, 1"	EA	1	L	
210	Crowfoot Attachment, ½ inch drive, 1-1/16"	EA	1	L	
211	Crowfoot Attachment, ½ inch drive, 1-1/8"	EA	1	L	
212	Crowfoot Attachment, ½ inch drive, 1-3/16"	EA	1	L	
213	Crowfoot Attachment, ½ inch drive, 1-1/4"	EA	1	L	
214	Crowfoot Attachment, ½ inch drive, 1-5/16"	EA	1	L	
215	Crowfoot Attachment, ½ inch drive, 1-3/8"	EA	1	L	
216	Crowfoot Attachment, ½ inch drive, 1-7/16"	EA	1	L	
217	Crowfoot Attachment, ½ inch drive, 1-1/2"	EA	1	L	
218	Crowfoot Attachment, ½ inch drive, 1-9/16"	EA	1	L	
219	Crowfoot Attachment, ½ inch drive, 1-5/8"	EA	1	L	
220	Crowfoot Attachment, ½ inch drive, 1-11/16"	EA	1	L	
221	Crowfoot Attachment, ½ inch drive, 1-3/4"	EA	1	L	
222	Crowfoot Attachment, ½ inch drive, 1-13/16"	EA	1	L	
223	Crowfoot Attachment, ½ inch drive, 1-7/8"	EA	1	L	
224	Crowfoot Attachment, ½ inch drive, 2"	EA	1	L	
225	Crowfoot Attachment, ½ inch drive, 2-1/8"	EA	1	L	
226	Crowfoot Attachment, ½ inch drive, 2-1/4"	EA	1	L	
227	Crowfoot Attachment, ½ inch drive, 2-3/8"	EA	1	L	
228	Crowfoot Attachment, ½ inch drive, 2-7/16"	EA	1	L	
229	Crowfoot Attachment, ½ inch drive, 2-1/2"	EA	1	L	

WTY (Warranty) Column definitions:

L = Lifetime Warrant

C = Commercial Warranty Available

N = No Warranty required

\* Government Furnished Materiel

\*\* RC (Remarks Code): For Government use only

**SPECIAL NOTATION:** Components marked with RC 16 or 22 will be provided by the contractor for Production Representative System only for purposes of space allocations, weights

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and testing. These components will not be included in all other future production sets.

16 = This item is not initially issued as a component of the SKO. The item may be requisitioned "as required" when authorized by the Commanding Officer.

22 = This is a consumable item, non-accountable on hand receipt, not issued with the tool set, quantity established by gaining unit.

\*\*\* RC 16 & 22: Although authorized for inclusion in the set, cylinders containing compressed or liquefied gas shall not be supplied with the set as delivered in order to avoid issues regarding handling and transport of hazardous materials.



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A1. Adapter Kit, Grease Gun Coupling. Shall fit manual or air-operated grease guns. Shall attach to any standard grease coupler for immediate service.

	Components
1	18" Steel Braid Rubber Grease Hose W/ Spring Guard & 4-Jaw Coupler
2	Hypodermic Needle Coupler For Lubricating Sealed Bearings
3	Straight Needlepoint Coupler
4	90 Degree 3" Needlepoint Coupler
5	9" Rigid Extension W/ 4-Jaw Coupler
6	Needlepoint Coupler, Right Angle
7	Right Angle Coupler
8	Standard Button-Head Coupler
9	1/4"-28 Zerk Fitting Extractor
10	1/8" NPT Zerk Fitting Extractor
11	Carrying case



A2. Adjusting Tool, Brake Shoe. The brake adjusting tool shall be a steel bar with flat, angled blade ends for insertion through slots in brake backing plates in order to turn the star nut used to adjust brake shoe position. Picture not available.

A3. Analyzer, Digital Battery. Hand-held analyzer shall be a conductance tester capable of testing condition and state of charge of all types of 12-volt lead-acid automotive batteries, including, standard, low maintenance, maintenance-free, gel, and Absorbed Glass Mat (AGM). Insulated leads and terminal clips shall be provided. Picture not available. (NOTE: Government Furnished Materiel)

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A4. Apron, Utility. Shall be an impermeable utility apron made of chloroprene rubber-coated polyester fabric. Shall be a full-length bib-type apron nominally 48" long and 34" wide, with a tie-tape back.



A5. Bar, Pinch, 26". The pinch bar shall have one end offset and formed into a pinch point with a width of 1". The other end shall be rounded and tapered for bringing holes in metal plates into alignment for assembly. The bar shall have a nominal 26" length and  $\frac{3}{4}$ " diameter, and shall be coated to resist corrosion (e.g. oil-coated, lacquered or painted).



A6. Bar, Pinch, 36". The pinch bar shall have one end offset and formed into a pinch point with a width of 1-1/4". The other end shall be rounded and tapered for bringing holes in metal plates into alignment for assembly. The bar shall have a nominal 36" length and 1" diameter, and shall be coated to resist corrosion (e.g. oil-coated, lacquered or painted).



A7. Bar, Wrecking. The bar shall have one end bent in the form of a gooseneck and the opposite end in the form of a pinch point. The gooseneck provided shall have a slotted claw suitable for pulling nails. The pinch point shall be offset and wedge shaped. The bar shall have a nominal 30" length overall, a  $\frac{3}{4}$ " diameter, and shall be coated to resist corrosion (e.g. oil-coated, lacquered or painted). (Reference CID A-A-2566, Type I, Size 4)



A8. Battery Filler, Gravity. The battery filler shall have a



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capacity of at least 2 quarts and shall shut off flow automatically when battery cells are filled to their proper level. Shall have an integral handle and a drip free design.

A9. Battery Filler, Syringe. The bulb-type syringe shall have a fluid capacity of at least 6 ounces and a flexible tube at least 6" long.



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A10. Battery Kit, Service. Shall consist of:

	Components
1	Angle Nose Pliers
2	Cable Clamp Pliers
3	Post Terminal Cleaner
4	Side Terminal Cleaner
5	Cable Clamp Puller
6	Carrying case

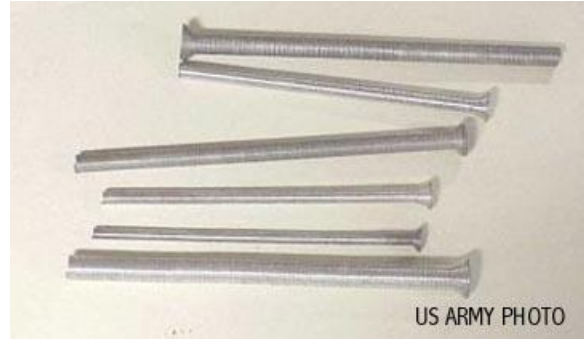


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A11. Bender Set, Tube, Hand Actuated. External coil spring, hand-actuated type, consisting of the following items:

	Components
1	Spring for 1/4 " OD tube, 10-11" long
2	Spring for 5/16" OD tube, 10-11" long
3	Spring for 3/8" OD tube, 10-11" long
4	Spring for 7/16" OD tube, 12-13" long
4	Spring for 1/2" OD tube, 12-13" long
5	Spring for 5/8" OD tube, 12-13" long



A12. Blade, Hand Hacksaw. The blades shall be bimetal, 12" long, .025" thickness, 24 teeth per inch and shall have 10 blades per bundle. (For use with Items 119 and 120)



A13. Blade, Abrasive, Cut-Off. The abrasive blade shall have an overall diameter of 3", a width of 1/16", and a 3/8" diameter arbor hole. (For use with item A148)



A14. Blow Gun, Air. The gun shall be the "lever-over" style, capable of providing automatic reduction of the air in the nozzle to a pressure less than 30 psig when supplied with an upstream air pressure up to 150 psig. The control valve shall permit the delivery of air in short blasts or in a continuous flow at the option of the operator. The nozzle shall be detachable. The gun shall seal completely against airflow at all pressures up to 120 psig. For protection of the operator from chip fly-back, the gun shall have a nozzle capable of providing an air-cone barrier around the main stream. The gun shall comply with OSHA Program Directive 100-1 (29CFR Part 1910.24 and OSHA Instruction STD 1-13.1). The gun inlet shall be provided with 1/4-18 NPT female threads. A male 3/8" ID quick disconnect fitting shall be installed on each gun



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A15. Box, Tote. The tote box shall approximately be 18.25" long, 5.5" high, and 11" wide. The box configuration shall permit it to be nested and stacked with like boxes.



A16. Brazing And Soldering Set. This propane gas torch set shall be suitable for brazing, soldering, and heating and conform to Underwriters Laboratories standard UL 147. The torch shall use fuel cylinders of a standard size containing 14 ounces of propane gas and having threads conforming to connection 600 of Compressed Gas Association (CGA) Standard V-1. (Note: The carrying case shall provide a storage location for a fuel cylinder, but no fuel cylinder is to be provided with the set. See Item A110.) The set shall contain the contents specified below. (Reference CID A-A-51128)



	Components
1	Burner unit
2	Pencil burner head
3	Utility burner head
4	Soldering head
5	Flame spreader
6	Flint lighter
7	Carrying case

A17. Brush, File Cleaner. Shall consist of a handle of wood or other suitable material with a fine steel wire card on one side, and a stiff bristle fiber brush on the other side. Brush shall be approximately 9" overall length, bristle area shall be approximately 4.5" long X 1.5" wide.



A18. Brush, Wire, Rotary, End Attachment, Solid Wire Filled. Shall be a solid filled brush with crimped wire extending





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parallel to a 1/4" arbor shaft, filled to the center of the brush. The brush body shall have a 1" outside diameter. The brush shall be rated for a maximum speed of 8000 RPM. The wire shall be high carbon tempered steel, 0.0204" diameter, with a trim length of 0.75-1.125". The brush shall conform to ANSI standard B165.1.

A19. Brush, Wire, Rotary End Attachment, Circular, Side Flair. Shall be a side flare brush with crimped wire extending 90-degrees from a 1/4" arbor shaft. The brush shall have a 1.5" outside diameter. The brush shall be rated for a maximum speed of 8000 RPM. The wire shall be crimped high carbon tempered steel, 0.0204" diameter. The brush shall conform to ANSI standard B165.1.



A20. Brush, Wire, Scratch. Shall be a curved-handle brush with bristles of 0.014" diameter carbon steel wire and are arranged in 4 X 18 rows. The exposed length of the bristles shall be approximately 1.125 to 1.250". The handle shall be wooden or molded plastic with an overall length of approximately 14 inches. The bristle area shall be 5.5 – 6.5" in length.



A21. Cable Assembly, Power. Shall be a three-conductor, 12 AWG extension cord for 120 VAC with insulation rated for 600 volts maximum. The cable jacket shall be oil, abrasion resistant, and the cable shall remain flexible at -25 degrees F. The cable assembly shall be 50' long with a NEMA 5-15P terminal on one end and a NEMA 5-15R terminal on the other end. Terminals shall be molded on the cable.



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A22. Cable Assembly, Booster. Shall be automotive battery booster cables conforming to SAE J1494. Shall be Super Heavy-Duty (rated for 750 A, minimum), and at least 25' long.



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A23. Cable Kit, Special Power. The kit shall contain one cable assembly, P/N 11682336-1 and two adapters, with P/N 11677570. It is a slave-start (jumper) cable for military vehicles with connectors conforming to a NATO standard. (The coiled cable depicted forms a disk roughly 14" in diameter and 6" thick. Approximate weight is 32 lbs.)



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A24. Caliper, Micrometer, Inside. Shall be an inside micrometer caliper of the rod and sleeve type, consisting of a micrometer head, measuring rods, locking screw(s) and spacing collars. These items in the appropriate combination shall be capable of measuring all inside distances from 2" to 12" to the nearest thousandth of an inch, with an accuracy of  $\pm 0.0007$ ". Storage case shall be provided.



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A25. Caliper, Vernier. Shall be a vernier style caliper capable of measuring inside distance, outside distance, and depth from 0 to 6" and from 0 to 150mm to the nearest thousandth of an inch, with the inch scale on the front and the metric scale on the back. The jaws for measuring outside dimensions shall have a throat depth of at least 1.25 inches. The slide shall be furnished with a thumb lock. Storage case shall be provided.



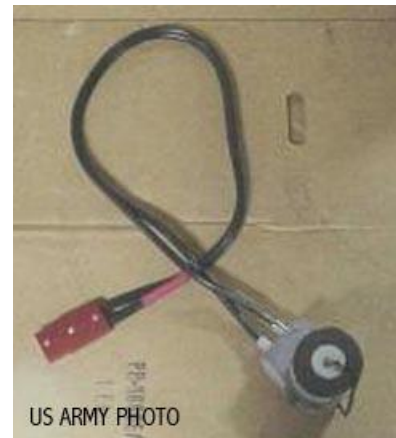
A26. Can, Radiator Filling. Shall be Plastic with a 12 qt. capacity. Shall have an integral spout and handle.



A27. Caps, Vise Jaw. Shall be for use in a 4" machinist's vise to protect hardware finish. The caps shall be copper, brass, or aluminum 1/8" thick. The vise jaw facing shall be at least 1". (See Item 155)



A28. Charger, Battery. Shall be a 12 Volt and 24-Volt automatic charger for both flooded and sealed automotive batteries. The charger shall provide deep discharge recovery and bad battery detection. Shall be capable of operating on both 120 and 240 VAC, 50 or 60 HZ, single-phase current. The charger shall be rated for an output of at least 70 Amps at 12 VDC and 40 Amps at 24 VDC. Provides protection from both reverse polarity and sparking.





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Shall be rated for all-weather outdoor use. Shall have a NATO slave receptacle adapter as well as standard battery terminal clamps.

A29. Clamp, C, 6" (Medium Service). Shall have 2.25" throat depth, a 5.75" minimum jaw opening with the screw fully retracted and an opening of not more than 2.625" when closed. The clamp shall be certified to a proof load of 11,250 lbs. The screw shall be at least 0.75" in diameter and have a swivel pad and a sliding cross pin handle at least 0.375" in diameter and 4" long.



A30. Cleaning Compound. Shall be a 5-gallon container of solvent for the degreaser (See item A40). Shall be biodegradable and contain no hazardous materials, conforming to MIL-PRF-680. (**Note: This item is for the Production Representative System only.**)



A31. Compressor Unit, Reciprocating. Shall be a portable compressor with a storage tank with outlet pressure regulator. The compressor shall have a 208-volt 3-phase AC electric motor. Compressor shall be able to operate all SATS pneumatic tools and equipment at their designed level of capability and performance. Compressor shall have wheels and handle for ease of movement. A 3/8" ID "T" pipe fitting and two female 3/8" ID quick-disconnect fittings shall be installed on each compressor. One branch of the "T" shall also incorporate a mist lubricator. (Picture not available.)

A32. Creeper, Mechanic's. Shall be approximately 47" long and 25.5" wide. Shall have large wheels to roll over grates, cracks in pavement and rocky, loose soil. The creeper shall have a low profile design to allow for maximum workspace clearance.



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A33. Crimping Tool, Terminal. Crimping tool shall be a manual compression type for insulated and non-insulated solder-less terminals on wire sizes from 22 through 10 AWG. Shall be able to cut and strip 22 through 10 AWG wires. Shall have integral dies for trimming six sizes of threaded fasteners: 4-40, 6-32, 8-32, 10-24, and 10-32. Shall have an insulated handle.



A34. Crowbar. Shall be 59-62" long and approximately 1 1/4" wide. Shall have a round handle tapering slightly toward handle end. Shall have a pinch-point style work end with square sides and a flat, single-beveled edge. The work end shall be equal in width to the distance across the flat surfaces of the bar.



A35. Crowfoot Attachment Set, Socket Wrench, Flare Nut, Inch. Shall have 3/8" female square drive and include the following sizes: 3/8", 7/16", 1/2", 9/16", 5/8", 11/16", 3/4" and 13/16".



A36. Crowfoot Attachment Set, Socket Wrench, Flare Nut, Metric. Shall have 3/8" female square drive, and include the following sizes: 9mm, 10mm, 11mm, 12mm, 13mm, 14mm, 15mm, 16mm, 17mm, and 18mm.



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A37. Cutting and Flaring Kit, Tube. Shall be able to cut, bend and flare copper, brass, and aluminum tubing. The kit shall contain a tube cutter with a cutting range of 1/8 to 1-1/8". The kit shall include a deburring tool. The kit shall provide tools for forming single flares on 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", and 3/4" tubing, and double flaring on 3/16, 1/4, 5/16, 3/8 and 1/2" tubing. This kit shall include swaging adapters for: 3/16", 1/4", 3/8", 1/2", 5/8", and 3/4" tubing. Carrying case shall be provided.



A38. Cutter, Bolt, Lightweight, 24". Shall have insulated handles made out of high quality aircraft aluminum. The cutting heads shall be replaceable.



A39. Cutter, Bolt, Replacement Head. Shall fit item A38.  
**(Note: This item is for Production Representative System only.)**



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A40. Degreaser, Portable. Shall be a portable table-top degreasing system including a tank at least 23" long by 17" wide by 6" deep. The system shall operate on 115 Volt 60 Hz current, and shall provide a recycling filtration system (0.1 micron) for recovery and re-use of the solvent. The system shall be provided with a cover equipped with a fusible link for emergency closure. Reusable air-transportable container for solvent shall be provided.



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A41. Die And Tap Set, Rethreading. Shall be designed for removing nicks and burrs from damaged standard and metric threads. The set shall contain the following items:

	Components
	Rethreading Dies, Inch, National Coarse
1	1/4-20
2	5/16-18
3	3/8-16
4	7/16-14
5	1/2-13
6	9/16-12
7	5/8-11
	Rethreading Dies, Inch, National Fine
8	1/4-28
9	5/16-24
10	3/8-24
11	7/16-20
12	1/2-20
13	9/16-18
14	5/8-18
	Rethreading Dies, Metric
15	6-1.00
16	8-1.25
17	10-1.00
18	10-1.25
19	10-1.50
20	11-1.50
21	12-1.25
22	12-1.50



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23	12-1.75
24	14-1.50
	Rethreading Taps, Inch, National Coarse
25	1/4-20
26	5/16-18
27	3/8-16
28	7/16-14
29	1/2-13
30	9/16-12
	Rethreading Taps, Inch, National Fine
31	1/4-26
32	5/16-24
33	3/8-24
34	7/16-20
35	1/2-20
36	9/16-16
	Rethreading Taps, Metric
37	6-1.00
38	8-1.25
39	10-1.00
40	10-1.25
41	10-1.50
42	11-1.50
43	12-1.25
44	12-1.50
45	12-1.75
46	14-1.50
	Rethreading files
47	US thread pitch 11 to 24 TPI
48	Metric thread pitch 75mm to 3.0mm
49	Storage case

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A42. Die and Tap Set, Thread. The set shall have 34 fractional #4 to 1/2" and 1/8"-27 NPT. It shall have 34 pieces from 3 mm to 12 mm and 1/8-28 BSP. It shall have 36 HSS drill bits and 5 extractors. Carrying case shall be included.



Description
<b>Machine Screw Hand Tap and Die (1 Pair EA)</b>
4-40 NC
6-32 NC
8-32 NC
10-24 NC
10-32 NF
12-24 NC
<b>Fractional-size Hand Tap and Die (1 Pair EA)</b>
1/4 -20 NC
1/4 -28 NF
5/16- 18 NC
5/16- 24 NF
3/5-16 NC
3/8-24 NF
7/16-14 NC
7/16-20 NF
1/2-13 NC
1/2-20 NF
<b>Inch Straight Pipe Hand Tap and Die (1 Pair)</b>
1/8-27 NPT
<b>Metric Machine Thread Hand Tap and Die (1 Pair EA)</b>

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3mm -0.5
4mm-0.7
4mm-0.75
5mm-0.8
5mm-0.9
6mm-1
<b>Metric Hand Taps and Dies (1 Pair EA)</b>
7mm-1.0
8mm-1.0
8mm-1.25
9mm-1.0
9MM-1.25
10mm -1.25
10mm-1.5
11mm-1.5
12mm-1.5
12mm-1.75
<b>Metric Straight Pipe Hand Tap and Die (1 Pair)</b>
1/8-28 BSP
<b>Spiral Flute Screw Extractors – (1 EA by Drill Bit Size)</b>
5/64"
7/64"
5/27"
1/4"
19/64"
<b>Drive Tools (1 EA)</b>
Plain die stock for 5/8" hex dies
Adjustable die stock
Adjustable handle tap wrench
T-handle wrench, #0 to 1/4" Taps
T-handle wrench, 1/4" to 1/2" Taps



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<b>HSS Drill Bits (1 EA by Size &amp; Style)</b>
Wire Gage#: 3, 7, 9, 16, 19, 20, 21, 25, 29, 30, 36, 30, 43
Letter: B, J, H, O, S, R, Z, I, Q, U
Fractional: 5/16", 3/8", 13/32", 21/64", 25/64", 27/64", 29/64", 5/64", 7/64", 5/32", 1/4" 19/64"
<b>Accessories (1 EA)</b>
Pitch gauge, metric
Pitch gauge, SAE
Screwdriver
Carrying Case

A43. Dresser, Abrasive Wheel. Dresser shall be provided with replaceable cutters, and protective hood.



A44. Drill-Driver, Battery Operated, Rechargeable. Shall be an 18 volt, 2 Amp-Hour battery-operated, 1/2" chuck drill with the following features: trigger-controlled variable speed; dual speed range (No-Load RPM Low: 0 to at least 400 rpm, High: 0 to at least 1000 rpm); trigger lock; forward and reverse operation; and a keyless chuck. For drilling operations, the drill shall produce at least 400 in-lbs torque at low speed and at least 120 in-lbs at high speed. For driving operations, the drill shall be furnished with a multi-position chuck permitting incremental limitation of the output torque over the range of 0 to at least 80 in-lbs. Battery and battery charger shall be supplied. Set shall come with a storage case.





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A45. Drill, Driver, Electric, 1/2". Shall be a "D" handle drill with a 1/2" keyed jaw chuck. Shall be reversible and have a 120 Volt 60 Hz, single-phase variable speed motor for speeds from 0 to at least 500 RPM. Shall be rated for drilling 1/2" holes in steel. Side handle shall be included.



A46. Drill, Battery Operated, Rechargeable, Right Angle, 3/8". Shall be an 18-volt, battery-operated, 3/8" drill with the following features: trigger-controlled variable speed; dual speed range (No-Load RPM Low: 0 to at least 400 rpm, High: 0 to at least 1000 rpm); trigger lock; forward and reverse operation; and a keyless chuck. The drill shall produce at least 300 in-lbs torque at low speed, and at least 60 in-lbs torque at high speed. Battery and battery charger shall be supplied. Set shall come with a storage case. (Photo not available.)

A47. Drill, Electric, Portable, 3/8". Shall have a 3/8" keyed jaw chuck, pistol grip handle and a variable speed 120 Volt 60 Hz motor for operation from 0 – 1300 RPM. Shall be rated for drilling holes in steel up to 3/8" in diameter. Shall be double insulated and designed for close quarters work. Drill head shall be not more than 4" from front to back, and not more than 2.5" in diameter.



A48. Drill, Electric, Portable, 1/2". Shall have a 1/2" keyed jaw chuck, pistol grip handle and a variable speed 120 Volt 60 Hz motor for operation from 0 – 750 RPM. Shall be rated for drilling holes in steel up to 1/2" in diameter. Shall be double insulated and designed for close quarters work. Drill head shall be not more than 4.5" from front to back, and not more than 2.5" in diameter.



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A49. Drill, Pneumatic, Right Angle, 3/8". Shall have a 3/8" keyed jaw chuck. Shall have a rear exhaust. The drill shall have forward and reverse. Shall be lever actuated with a 1/2 hp motor and a minimum free speed of 1200 RPM. A male 3/8" ID quick disconnect fitting shall be installed on each drill.



A50. Drill Set, Twist. Shall contain 1 each, from 1/16 to 1/2", in 1/64 increments (29 bits). Drill bits shall be cobalt steel alloy with 135 degree split point and straight round shank. Drill bits shall be intended for use on stainless steels, heat-treated, steels, forgings, chilled cast iron, and other applications involving extreme hardness or abrasive materials. Shall have a drill bit index for storage.



A51. Drill Set, Twist, Left Hand. Shall contain 1 each, 5/64", 7/64", 1/8", 5/32", 3/16", 7/32", 1/4", 9/32", 19/64", 5/16", 11/32", 3/8", 13/32", 7/16", 15/32", and 1/2" (16 bits). Drill bits shall be cobalt steel alloy with 135 degree split point and straight round shank. Drill bits shall be intended for use on stainless steels, heat-treated, steels, forgings, chilled cast iron, and other applications involving extreme hardness or abrasive materials. Shall have a drill bit index for storage. (Picture not available.)

A52. Extinguisher, Fire. Shall be 5lb nominal capacity rating for Type A, B, and C fires. **(NOTE: This item for Production Representative System only.** Mounting location with appropriate signs or labels shall be provided.)



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A53. Extractor Set, Screw. Shall be a set of left hand drill bits and corresponding spiral flute screw extractors. It shall contain 7 left-hand drill bits ranging from 1/8" to 1/2" by 16ths, and 6 sizes of screw extractor.



A54. Extractor Set, Hardened Screw. The extractor screw set shall be designed for extraction of high-strength fasteners, Grades 2 through 5 and Class 5.6 to 10.9, as well as stainless steel bolts. The set shall contain extractors suitable for removing FART fasteners sizes 1/8" through 1/2" and Metric fasteners sizes M3 through M12.



A55. Face shield, Industrial. Shall be an industrial face shield with crown protector complying with ANSI Z87.1. The clear, replaceable visor shall be 11.5 ± 1 inches wide by 8.0 ± 1 inches long and at least 0.040 inches thick. The headgear shall be of the adjustable, positive lock style, with a tilting visor support.



A56. File Set, Hand. Shall consist of four files, two 12" long half-round American pattern bastard cut files, and two 12" long 1/2" diameter round American pattern bastard cut files. Each file shall have a plastic, permanently affixed, ergonomic handle



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A57. File Set, Thread Restorer. Shall be a set of files designed to restore damaged or worn external threads. Each file shall have eight faces, with each face cut for restoring a different thread size. The set shall contain:

	Components
1	File for inch coarse threads, 11, 12, 13, 14 1/8, 20, and 24 TPI
2	File for inch extra fine and extra coarse threads, 9, 10, 12, 16, 20, 27, 28, and 32 TPI
3	File for inch pipe threads, 8, 10, 11-1/2, 14, 16, 18, 24, and 27 TPI
4	File for metric threads, 0.75, 1.0, 1.25, 1.50, 1.75, 2.0, 2.5, and 3.0 mm
5	Carrying case



A58. Filler And Bleeder Kit, Brake System. Shall be a manual fluid injector. Shall have a full-range adjustable metering. Shall be able to produce 150 psi of injection pressure with a 15ml injection dosage. The kit shall include:

	Components
1	Graduated fluid bottle assembly with quick couplers, debris magnet and holder
2	Tube connectors
3	1/8 x 0.150 90 degree Adapter for 1/8" bleeder valves or ports
4	3/16 x 4mm 90 degree Adapter for 1/8" or 3/16" valves
5	Quick coupler assembled with 3/16 x 4 mm 90 degree adapter
6	Quick couple assembly for 3/16" of 1/4" bleeder valves
7	Taper Tip Adapters (4 ea)
8	Luer Male/Female Plug
9	Universal Port Adapter
10	3/16" x 4mm Straight Adapter
11	3/16" x 0.150 Straight Adapter
12	3/16" x 3/16" Straight Adapter
13	Taper Adapter
14	Pedal Flush and Capture Assembly with check valve



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	and quick couplers
15	28mm Bottle cap with siphon and quick coupler
16	33mm bottle cap with siphon and quick coupler
17	Hand-pumped Injector with inlet and outlet hose assemblies
18	Carrying case

A59. Filter, Solvent. Recycling filter for portable degreaser (Item A40), capable of removing particles down to one micron in size. **(Note: This item is for Production Representative System only)**



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A60. Finger, Mechanical. Shall have an overall length of 17.5", four claws, 1" jaw opening and an 8" flexible section.



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A61. Fountain, Eye and Face. Shall be a pressurized self-contained eyewash conforming to ANSI/ISEA Z358.1. Shall have a stainless steel tank with a capacity of at least six gallons, and a 5-foot hand-held drench hose and nozzle.



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A62. Funnel. Shall be a polypropylene funnel with a rigid spout and a capacity of 2 quarts.



A63. Funnel, Flexible Spout. Shall be a one-quart capacity funnel with a flexible spout at least 13 inches long, and a removable strainer. The spout shall have an automatic transmission tip. The strainer shall have a mesh of 70-100 per linear inch. (Reference CIDA-A-1068)



A64. Gage, Bolt and Thread, Metric. Folding-blade style case with 10 gages on one end for checking bolt diameters in the following sizes: 5mm, 6mm, 8mm, 9mm, 10mm, 11mm, 12mm, 16mm, 20mm; and 24mm. Each gage shall identify both the size of the bolt and the size of the wrench it requires. The opposite end of the case shall have 12 gages for determining thread pitch in millimeters: 0.80, 1.00, 1.25, 1.30, 1.40, 1.50, 1.60, 1.75, 1.80, 2.00, 2.50, and 3.00. The case shall list the standard metric bolt hardness grades and the corresponding bolt head markings. The case and gages shall be fabricated of corrosion-resistant material (e.g. stainless steel). (Photo not available.)

A65. Gage, Bolt and Thread, Standard. Folding-blade style case with 10 gages on one end for checking bolt diameters in the following sizes: 1/4", 5/16", 3/8", 7/16", 1/2", 9/16", 5/8", 3/4", 7/8", 1". Each gage shall identify both the size of the bolt and the size of the wrench it requires. The opposite end of the case shall have 12 gages for determining pitch in threads per inch: 28, 24, 20, 18, 16, 14, 13, 12, 11, 10, 9, and 8. The case shall list the standard bolt hardness grades and the corresponding bolt head markings. The case and gages shall be fabricated of corrosion-resistant material (e.g. stainless steel). (Photo not available.)

A66. Gage, Wheel Alignment. Shall be a scribe-type toe-in Gauge for trucks which can extend up to a 96" (243.84 cm) width, with adjustable legs which can extend up to 17 1/2" (44.45 cm) high. (Photo not available.)



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A67. Gloves, Rubber, Industrial. Shall be size 11, industrial rubber gloves for handling organic solvents, approximately 14 inches long. Cuff edge may be furnished with a self-binding roll or flat and reinforced.



A68. Goggles, Industrial. Shall be cover goggles, direct ventilation, conforming to ANSI Z87.1. Lens shall be clear and replaceable. The headband shall have a length of at least 18 inches.



A69. Grease Gun Kit. Shall provide the capability to pump lubricating grease from standard 5gallon/35 lb grease containers into standard grease guns and the included portable pressurized lubricating system. The portable lubricating system shall hold at least ten pounds of grease and shall be capable of producing 10,000 psig at the nozzle. Kit shall include the following components:



	Components
1	Grease Filler Pump
2	Grease Gun Filler Attachment
3	Bearing Packer Attachment
4	Transfer/Filler Attachment
5	Mini-Lube System
6	Quick Connect System

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A70. Grease Gun, Pneumatic. Shall be an air-powered grease gun with 12" flexible extension and 6" rigid extension. Shall include 3/8" X 50' PVC hose; with quick connect end and a vehicle pneumatic brake system glad hand. The gun shall use standard grease cartridges.



A71. Grinding Machine, Utility. Shall be a bench-mounted grinder with two spindles having a diameter of 5/8" each. Shall be for grinding wheels with a diameter of 7 inches maximum, and a thickness 1 inch maximum. There shall be a tilted work rest for each wheel. The nominal spindle speed shall be 3450 RPM, and the grinder shall have an integral 115 Volt, 60 Hz, single phase, 0.5 HP motor. Shall be furnished with one coarse grit straight abrasive wheel and one fine grit straight abrasive wheel.



A72. Gun, Fluid, Direct Delivery. Shall be a one-pint capacity suction-fill gun used for filling and draining. Shall have an 11" flexible vinyl hose.



A73. Hammer, Hand, Carpenters', Curved Claw, 16 Oz. Shall be a curved claw carpenters' nailing hammer with a fiberglass handle and a cushion grip. It shall have a 16 oz non-magnetized head.



A74. Hammer, Hand, Soft Face, Dead Blow, 52 Oz. The hammer shall have a face diameter of 2.75", a head weight of 52 oz, a nonmetallic head, a steel reinforced handle, and an overall length of 16".





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A75. Hammer, Hand, Soft Face, Dead Blow, 10 Oz. The hammer shall have a face diameter of 1.25", a head weight of 10 oz, a nonmetallic head, a steel reinforced handle, and an overall length of 10".



A76. Hammer, Sledge, Double Faced, 10 Lb. The hammer shall have a head weight of 10 lbs and a face diameter of 2.5 inches. The fiberglass handle shall have a cushioned grip and a length of 32 inches.



A77. Hammer, Hand, Dead Blow, Ball Peen. The hammer shall have a hardened steel face and peen, a head weight of 40 oz, a face diameter of 1-11/16", a steel reinforced handle, and an overall length of at least 15".



A78. Hammer Set, Holder and Inserts. Shall consist of two soft face hammers, with tips. The head diameters shall be 1.5" and 2", respectively. The 1.5" hammer shall have one medium and one hard non-metallic tip. The 2" hammer shall have one tough and one extra hard non-metallic tip. For easy replacement, the surface protective tips shall be attached to the hammerheads by threaded studs.



A79. Hammer, Pneumatic. Shall consist of a hand-held pneumatic hammer, with tail pipe cutter, claw ripper/edge tool, flat chisel, tapered punch. Also provided shall be 3 ball joint/ tie rod separators (not shown) with 5/8, 13/16, 1-1/4 inch openings, respectively. The hammer shall be provided with quick-change retainer for chisels and other accessories having standard 0.401" diameter shanks. The retainer shall lock the chisel or other accessory in place during use. Carrying case and lubricating oil shall be included. A male 3/8" ID quick disconnect fitting shall be installed on each hammer.



A80. Holder, Punch and Chisel. Shall be a screw-clamp



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style holder with a capacity to hold punches and chisels with handles up to 1" in diameter.

A81. Hose Assembly, Air, Nonmetallic. Shall have an inside diameter of .375", and a length of 50 feet. Shall be highly flexible, highly resistant to flex fatigue, oils, solvents, cuts, and abrasion; and rated for a working pressure of at least 175 psig. Shall have an operating temperature range of -25 to +120 degrees F. Shall include 3/8" male and female quick disconnect couplings, one installed on each end. (For use with Item A31.)



A82. Indicator, Dial. Shall be a dial indicator of the type with the spindle perpendicular to the dial from the back of the case. The indicator shall have a jewel bearing movement and a plunger style contact point. The indicator shall be 1.5" (nominal) in diameter, shall have a spindle travel from 0 to 0.200", shall be marked from 0 to 100 in 0.001" graduations and shall have a zero position setting adjustable 360 degrees. The dial indicator shall be provided with standard button and ball contact points, a tool post holder having an upright spindle, an arbor clamp, a hole measurement attachment, and a carrying case.



A83. Inflator-Gage and Hose Assembly, Pneumatic Tire. The inflator gage assembly shall satisfy the requirements of OSHA Regulation 29 CFR 1910.177(d)(4) and CID A-A-59568, Class 3, Style D, Range 2. The hose shall have a 0.25" inside diameter, a rated working pressure of at least 175 psig, a burst pressure of at least 900 psig; and shall be at least 10 feet long. The pressure gage shall be an enclosed self-contained cartridge with a range of 10 to 120 psig, graduated in two-pound increments. A lever-operated valve shall control inflation. The assembly shall include a deflating valve between the gage and hose. Two clip-on valve chucks, sizes 0.302-32 and 0.482-26, shall be supplied with the assembly. The hose end shall be provided with a female quick-disconnect fitting, and the clip-on valve chucks shall each be provided with a male quick disconnect nipple to provide for rapid change. The chucks shall be attached to the end of the



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hose with light chain to prevent loss. A male 3/8" ID quick disconnect inlet fitting shall be installed on each assembly (not shown).

A84. Jack Kit, Hydraulic, Hand. The jack shall be a 20-ton rated remote hydraulic hand jack with a manually operated pump, a remote ram, and a hose assembly connecting the two. The pump shall have a lever operated handle and a relief valve. The ram shall have a nominal 12 inch collapsed height and a nominal 5 inch plunger travel. The hose shall have a minimum length of six feet, with a quick disconnect coupling at the ram end. The kit shall include the following attachments, which shall safely withstand direct (concentric) loads of 20,000 pounds and indirect (offset) loads of 8,000 pounds:



	Components
1	One serrated or grooved saddle
2	One toe lift threaded to fit ram cylinder
3	One plunger base
4	One ram (body) base
5	One chain pull plate
6	Two 8' (nominal) chains with 3/8" (minimum) link cross-section diameter, each furnished with a hook on one end
7	Two female threaded couplings, ram to extension
8	Male threaded extension tubes:
	- One 10" – 12" long
	- One 18" to 20" long
	- One 24" to 30" long
	- One additional extension tube long enough to provide a total extension length of at least 60".
9	Operator's Manual
10	Carrying case

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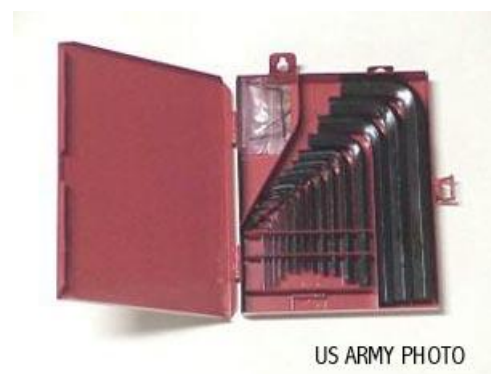
A85. Jack, Bottle, Hydraulic, Hand, 12 Ton. The jack shall be a self-contained unit consisting of a solid plunger and an integral pump, ram and reservoir. The jack shall have a rated load capacity of at least 12 tons. It shall have a minimum extended height 16.5" and maximum retracted height of 9.125", and shall be supplied with a removable pump handle.



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A86. Key Set, Hex, Inch. Shall consist of the following items:

Components		
	Size	Length
1	0.028"	1-1/4"
2	0.035"	1-1/4"
3	0.050"	1-11/16"
4	1/16"	1-3/4"
5	5/64"	1-7/8"
6	3/32"	2"
7	7/64"	2-1/8"
8	1/8"	2-1/4"
9	9/64"	2-3/8"
10	5/32"	2-1/2"
11	3/16"	2-3/4"
12	7/32"	3"
13	1/4"	3-1/4"
14	5/16"	3-3/4"
15	3/8"	4-1/4"
16	1/2"	5-1/4"
17	9/16"	5-3/4"
18	5/8"	6-1/4"
19	Indexed container	



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A87. Key Set, Hex, Metric. Shall consist of the following items:

Components		
	Size	Length
1	0.07 mm	31 mm
2	0.09 mm	31 mm
3	1.3 mm	41 mm
4	1.5 mm	44 mm
5	2 mm	49 mm
6	2.5 mm	55 mm
7	3 mm	62 mm
8	4 mm	68 mm
9	5 mm	78 mm
10	6 mm	88 mm
11	8 mm	98 mm
12	10 mm	109 mm
13	12 mm	122 mm
14	14 mm	136 mm
15	17 mm	156 mm
16	Indexed container	



A88. Lamp, Fluorescent. Shall be a 13watt fluorescent bulb with a minimum 10,000-hour bulb life. (Replacement bulb for item A91.)  
**(NOTE: This item for Production Representative System only.)**



A89. Lift, Transmission and Differential. Shall be a hydraulic lift for installing and removing transmissions and differentials. Shall have a rated capacity of at least 2000 pounds. Shall have a height of 10" maximum when fully lowered and a lift height of at least 36". Saddle shall tilt and lock at least 10 degrees from the horizontal in all directions. The lift shall be provided with four swivel casters and handgrips to permit accurate positioning of the load during installation. The lift shall be provided with a variety of chains, wedges, clamps, bars, brackets, and other attachments for the saddle to permit a wide variety of transmissions and differentials to be secured and stabilized on the lift. (The transmission lift depicted has overall envelope dimensions of 28" wide, 43" long, and 12" high with the lift arm fully lowered. It comes with a box of accessories that is 32" long by 8" wide by 6.5" tall. Approximate weight of the





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transmission lift is 200 lbs, and the box of accessories weighs 101 lbs.)

A90. Light, Battery Operated, Rechargeable. Shall be an 18-volt, 2 Amp-Hour battery-powered work light. Work light shall have the following features: an on-off switch; a wide-angle fixed beam, a stable base for stranding upright on flat surfaces; and a multi-position swivel head which permits the beam direction to be incrementally adjusted from parallel with the handle through an arc of 120 degrees. Battery and battery charger shall be supplied. Set shall come with a storage case.



A91. Light, Extension, Fluorescent. Shall be a "Stubby" style 13 inch fluorescent work light, 13 watts, 25 foot cord, 120 volt, 60 Hz.



A92. Light, Extension, LED. Shall be a 10 to 40 Volt DC work light with a 20-foot cord, and battery clips. The combined LED elements shall provide illumination equal to that of a 13-watt fluorescent or 40-watt incandescent bulb. Element casing shall be provided with a hook. (Photo not available.) (**NOTE: This item is for Production Representative System only.**)

A93. Lubricating Gun, Hand. Shall be a pistol-grip style variable stroke grease gun with flexible 10" extension hose. Shall be suitable for both standard 14-1/2 oz cartridges and bulk fill, and shall be provided with a filler nipple and a bleeder valve.



A94. Lubricating Gun, Battery Operated, Rechargeable. Shall be a 12-volt battery-powered grease gun with a 24" flexible hose. Battery and battery charger shall be supplied. Set shall come with a storage case. (Photo not available.)

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A95. Measure, Liquid, 8 Quart. Shall be a leak-proof can of the type used for measuring and dispensing oil. The can shall include a finger operated flow-control release valve and loop handle on the side opposite the spout. The bottom shall be designed to allow the can to drain completely while being held level. It shall have a flexible 14" spout with a 60-degree vertical swivel and a pouring tip that dispenses oil from the bottom of the can. The spout shall fasten in the up-right position when not in use.



A96. Measure, Liquid, 2 Quart. Shall be a leak-proof can of the type used for measuring and dispensing oil. The can shall include a finger operated flow-control release valve and loop handle on the side opposite the spout. The bottom shall be designed to allow the can to drain completely while being held level. It shall have a flexible 14" spout with a 60-degree vertical swivel and a pouring tip that dispenses oil from the bottom of the can. The spout shall fasten in the up-right position when not in use.



A97. Multimeter. Shall be able to measure AC and DC voltage, shall measure resistance in Ohms, shall measure AC and DC current, shall test diodes, and shall have an audible signal for continuity checks. Shall measure average 45 – 1000 Hz AC voltage up to 1000 volts with an accuracy of  $\pm 2\%$  and a display resolution to 1 mV. Shall measure DC voltage up to 1000 volts with an accuracy of  $\pm 3\%$  and a display resolution to one 0.1 mV. Shall measure resistance up to 32 M Ohms with an accuracy of  $\pm 5\%$  and a display resolution to 0.1 Ohm. Shall measure 45 - 1000 Hz AC current up to 10.0 amps with an accuracy of  $\pm 2.5\%$  and a display resolution of 0.01 mA. The multi-meter shall have a four-place digital display, display hold, manual/automatic range selection, and an auto-off mode to conserve battery life. The meter shall be suitable for outdoor use, including a dust and water resistant case, an operating temperature range of 15 – 120 degrees F, and ability to withstand a ten-foot drop. Batteries, heavy-duty test leads, flat-blade probes and a user manual shall be included. (Picture not available)

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A98. Multiplier, Torque. The torque multiplier shall have a maximum rated output torque of 2000 ft-lb in both the clockwise and counterclockwise directions. Multiplier shall consist of a detachable reaction bar and a metal housing containing a precision planetary gear multiplier having a torque gear ratio of 3 to 1. The multiplier shall have a  $\frac{3}{4}$ " female square drive input and a 1" male square drive output in accordance with ANSI B107.4. The overall length of the torque multiplier with reaction bar shall be 25 inches, nominal.



A99. Oiler, Hand. The hand-pumped oiler shall have a  $\frac{1}{4}$  pint (4 oz.) capacity. Shall have a nozzle adjustable for delivery from a fine mist to a thin stream. The spout shall have a length of at least three inches.



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A100. Pan, Drain. Shall be a pan of a type intended for capturing oil and other fluids being drained from automotive vehicles. It shall be a shallow receptacle equipped with an anti-splash baffle for ease of pouring. The pan shall include two handles for lifting, pouring, and positioning the pan under an automotive vehicle. One handle shall be positioned opposite the pouring spout. The other handle shall not interfere with pouring operations. The pan body and handles shall be sufficiently strong and rigid to make the pan suitable for carrying when filled to capacity with oil. The pan shall have a capacity of at least 6 gallons.



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A101. Plate, Bolster, 24" x 24". Shall be a plate of non-metallic material 2 feet square suitable for use as cribbing under a 12-ton bottle jack when used on unpaved surfaces. The bolster plates shall be fabricated of material with sufficient durability, strength, rigidity, and resilience to withstand their rated loads without fracturing, splintering, or permanently deforming when the loads are imposed on a frequent and long-term basis at any and all temperatures from  $-25^{\circ}\text{F}$  to  $+125^{\circ}\text{F}$ . The material shall neither absorb nor be subject to damage from water, petroleum products, and detergents; and shall neither be damaged by nor support the growth of fungus and mildew. The material shall not corrode, and shall be resistant to damage from ozone and ultraviolet light. The bolster plates shall have a surface area and thickness sufficient to distribute their rated loads to an average value of 50 pounds or less per square inch (approximately  $2' \times 2'$ ). The bolster plates shall be provided with handhold opening(s) at least 6"



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x 3" to provide a secure grasp while wearing winter gloves as well as with the unprotected hand. (Photo not available.)

A102. Plate, Bolster, 40" x 72". Shall be at least 3 feet 4 inches by 6 feet, and suitable for use as cribbing under a 2000 lb capacity transmission lift when used on unpaved surfaces. The bolster plates shall be fabricated of material with sufficient durability, strength, rigidity, and resilience to withstand their rated loads without fracturing, splintering, or permanently deforming when the loads are imposed on a frequent and long-term basis at any and all temperatures from -25 °F to +125 °F. The material shall neither absorb nor be subject to damage from water, petroleum products, and detergents; and shall neither be damaged by nor support the growth of fungus and mildew. The material shall not corrode, and shall be resistant to damage from ozone and ultraviolet light. The bolster plates shall have a surface area and thickness sufficient to distribute their rated loads to an average value of 50 pounds or less per square inch and provide a smooth surface for positioning the jack beneath a vehicle component (approximately 4' x 6'). The bolster plates shall be provided with handhold opening(s) at least 6" x 3" to provide a secure grasp while wearing winter gloves as well as with the unprotected hand. (Photo not available.)

A103. Pliers, Lock-Ring. Shall have a straight tip design conforming to ASME B107.19, Type III, Class1, for spreading snap-lock rings.



A104. Pliers, Lock-Ring. Shall have a notched top design conforming to ASME B107.19, Type III, Class 2, for spreading snap-lock rings found on brakes, transmissions, pedal shifts, clutch shifts, and machine tools. Shall also be suitable for use on piston rings. Shall be able to hold rings securely in any position.



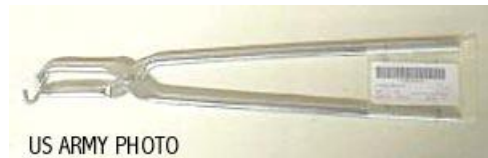
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A105. Pliers Set, Retaining Ring. The set shall contain fixed-tip convertible snap-ring pliers for use on internal and external retaining rings. The pliers shall have cushion grip handles. The set shall contain the following items:

	Pliers Tip Diameter	Pliers Tip Configuration
1	.038"	Straight
2	.038"	45 degree
3	.038"	90 degree
4	.047"	Straight
5	.047"	45 degree
6	.047"	90 degree
7	.070"	Straight
8	.070"	45 degree
9	.070"	90 degree
10	.090"	Straight
11	.090"	45 degree
12	.090"	90 degree
13	Carrying case	



A106. Pliers, Brake Repair, Heavy. The pliers shall be provided with a hooked or slotted jaw and a bent or curved jaw suitable for removing and replacing brake springs for heavy trucks. The end of one or both handles shall also be furnished with a groove or other suitable means for quick replacement of brake springs. The working ends of the pliers shall be hardened to a reading of 48-52 on the Rockwell C scale. The pliers shall be at least 19" long. (Reference GGG-P-00474, Type II, Class 1, Style 1)



A107. Pliers, Brake Repair, Light. The pliers shall be provided with a hooked or slotted jaw and a bent or curved jaw suitable for removing and replacing brake springs for light trucks. The end of one handle shall be furnished with a groove or other suitable means, and the end of the other handle shall be furnished with a socket or cup for quick replacement of brake springs. The working ends of the pliers shall be hardened to a reading of 48-52 on the Rockwell C scale. The pliers shall be at least 12" long. (Reference GGG-P-00474, Type II, Class 2, Style 2)



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A108. Pliers, Wire Twister. The pliers shall be of a type used primarily for twisting safety wires. Pliers shall have a spiral mechanism to provide a uniform a right-hand (clockwise) twist. The jaws shall have a hardness reading of 36-50 on the Rockwell C scale, and shall be furnished with wire cutters. Jaws shall lock in the closed position. The jaws shall have serrated surfaces for gripping wire and a diagonal (standard) nose configuration. The pliers shall have a maximum capacity of .060" diameter wire and an overall length of 12". (Reference ASME B107.18M)



A109. Pneumatic Bag Kit, Lifting. The kit shall have the rated capacity to lift 10 tons to a height of at least 21". A 3/8" ID male to 1/4" ID male quick disconnect adapter shall be supplied in addition to the kit.



	Components
1	Lift Bag, 2 each
2	In-line Relief valve, 2 Each
3	Air Hose, 16 foot (nominal), 1 each of red, black, and yellow,
4	Dual outlet air controller, 1 each

A110. Propane Fuel Cylinder. Shall be a fuel cylinder of a standard size containing 14 ounces of propane conforming to Gas Processors' Association (GPA) Standard 2140, and having threads conforming to connection 600 of Compressed Gas Association (CGA) Standard V-1. (**Note: This item is for Production Representative System only.** Used with Item A16. Photo not available.)

A111. Puller Set, Mechanical. Shall consist of pullers and puller accessories. Shall be rated for a pulling force of at least 10 tons. The puller set shall consist of:

2-Arm Pullers
4" Spread, 3-1/4" Reach
6" Spread, 3-1/4" Reach
9" Spread, 5" Reach
12" Spread, 11" Reach



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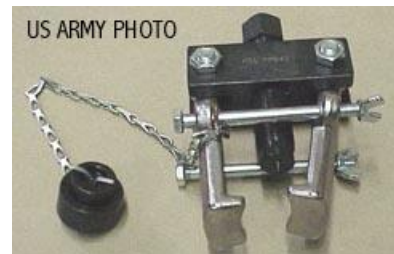
<b>Bearing Separators</b>
1/4" to 15/16" Capacity
1/8" to 2" Capacity
1/2" to 4-5/8" Capacity
<b>Press-Puller</b>
Frame and forcing screw with 2-1/8" to 7-1/4" Spread
Two Leg Ends
Two 6-3/4" Legs
Two 15-3/4" Legs
Two Leg Connectors
<b>Gear and Pulley Puller</b>
1-1/2" – 4-1/4" Spread, 13" forcing screw
<b>Internal Puller</b>
1-1/2" to 6" Spread, 4" Reach
<b>Steering Wheel Puller</b>
Body with forcing screw
Two Cap Screws 3/8"-16 x 3-1/2"
Two Cap Screws 5/16"-18 x 3-1/2"
Two Cap Screws 5/16"-24 x 3-1/2"
Two Cap Screws 5/16"-24 x 4" (SIR)
Two Cap Screws M8"-1.25 x 90mm
<b>Pittman Arm Puller</b>
2-3/4" Spread, 5-1/2" Reach
<b>Harmonic Balancer Puller</b>
Frame and forcing screw for bolt circle diameters from 1-1/2" to 4-5/8"
Three cap screws 3/8"-24 x 3"
Three cap screws 3/8"-16 x 3"
<b>Side Hammer</b>
2 Leg/3 Leg head with Inside/Outside Legs, 1-1/4" to 4-1/2" Spread, 2-1/2 lb.

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Hammer
<b>Pilot Bearing Puller</b>
2 Leg Inside Head, 1-1/2" Spread and 3/4" Reach, 1-3/4 Lb. Hammer
<b>Threaded Shaft Adapters</b>
5/8"-18 x 5/8"-18
5/8"-18 x 3/4"-16
5/8"-18 x 7/8"-14
5/8"-18 x 1"-14
5/8"-18 x 1-1/8"-12
5/8"-18 x 1-1/4"-12
<b>Hollow Shaft Adapters</b>
1" x 3/4"
1-1/8" x 7/8"
1-1/4" x 1"
1-3/8" x 1-1/8"
1-5/8" x 1-1/4"
1-3/4" x 1-3/8"
1-7/8" x 1-1/2"
2" x 1-5/8"
2-1/8" x 1-3/4"
2-3/8" x 1-7/8"
2-1/2" x 2"

A112. Puller, Mechanical, Steering Wheel. Shall be made to remove steering wheels. It shall contain a puller body, forcing screw, 2 column adapters and 3 steering shaft adapters. (Picture not available.)

A113. Puller, Mechanical, Pittman Arm. Shall be a Pittman arm puller for medium and heavy trucks. Shall have adjustable puller legs that reach a length 5.5" nominal and a maximum spread of 2.75". Shall have clamp bolts that lock the adjustable jaws on the Pittman arm to assure a positive grip while pulling, and an adapter.



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A114. Pump, Lubricant. Shall consist of a drum dolly and a manual lubricant pump with abrasion-resistant delivery hose (5 feet long, nominal). The pump base shall enable it to be attached to the top of a standard 5-gallon bulk container for delivering lubricant directly from the container. The dolly shall provide caster wheels and a base frame suitable for retaining a standard 5-gallon bulk container. Storage space shall be provided for the lubricant pump mounted to the 5-gallon container.



A115. Punch and Chisel Set. Shall consist of 26 pieces, as listed in the table below.



	Description
1	3/4" Cold Chisel, length 6-1/2" minimum
2	1/4" Cold Chisel, length 4" minimum
3	5/16" Cold Chisel, length 4" minimum
4	3/8" Cold Chisel, length 5" minimum
5	1/2" Cold Chisel, length 5-3/4" minimum
6	5/8" Cold Chisel, length 6" minimum
7	7/8" Cold Chisel, length 7-1/2" minimum
8	1" Cold Chisel, length 8" minimum
9	1-3/16" Cold Chisel, length 9" minimum
10	3/32" Drive Pin Punch
11	1/8" Drive Pin Punch
12	5/32" Drive Pin Punch
13	3/16" Drive Pin Punch
14	7/32" Drive Pin Punch
15	1/4" Drive Pin Punch



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16	1/8" Tip Drift Punch, length 8", minimum
17	3/16" Tip Drift Punch, length 8", minimum
18	1/4" Tip Drift Punch, length 8-1/2", minimum
19	3/32" Tip Starting Punch
20	1/8" Tip Starting Punch
21	3/16" Tip Starting Punch
22	7/32" Tip Starting Punch
23	1/4" Tip Starting Punch
24	#2 (5/16" Body) Center Punch, length 3-1/4" minimum
25	#7 (3/8" Body) Center Punch, length 4" minimum
26	#3 (1/2" Body) Prick Punch, length 5" minimum

A116. Punch Set, Cutting, Gasket. Shall contain mandrel and hollow punches of these sizes: 1/4", 5/16", 3/8", 7/16", 1/2", 9/16", and 5/8". Carrying case shall be included.



A117. Sander/Grinder 4.5". The right-angle style grinder shall have a 120 Volt, 60 Hz, single phase, 2.1 hp variable speed motor, with a maximum rated speed of at least 10,000 rpm, long life brushes and high output fan. The spindle thread size shall be 5/8"-11. The grinder shall have a lock off button and shall be double insulated.



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A118. Saw, Hand, Crosscut. Shall be a straight back cross-cut wood saw with a hardwood handle, a blade length of 15" and 9 teeth per inch.



A119. Saw, Hand, Metal Cutting. Shall be a compact, lightweight utility mini-hacksaw for work in close quarters. Shall accept standard hacksaw blades.



A120. Saw, Hand, Metal Cutting. Shall be high tension, 12" length, with a 4" throat.



A121. Scale, Weighing. Shall be a straight-face hanging spring scale with a range of from 0-50 pounds avoirdupois, graduated in 1 pound increments. The scale shall be provided with a suspension ring on the top of the housing and a hook on the end of the shaft for accepting the load. The scale shall be accurate within 4 pounds for loads less than 20 pounds, and within 8 pounds for loads of 20 pounds or more.



A122. Scraper, Gasket. Shall be a carbide edge scraper with a 0.125" thick steel shank.



A123. Screwdriver Attachment Set, Torx. The set shall contain 1/4" square-drive sockets for Torx sizes T-8, T-10, T-15, T-20, T-25, T-27, and 3/8" square drive sockets for Torx sizes T-30, T-40, T-45, T-47, T-50 and T-55. Sockets shall be two-piece construction. (Picture not available.)



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A124. Screwdriver Attachment Set, Inch, Hex. The set shall contain square-drive sockets for socket-head fasteners that range from 1/8" to 5/8". Items are listed below:

#	Description
1	3/8" Drive 5/32" Hex Bit
2	3/8" Drive 7/32" Hex Bit
3	1/2" Drive 5/8" Hex Bit
4	1/2" Drive 9/16" Hex Bit
5	1/2" Drive 1" Hex Bit
6	3/8" Drive 1/4" Hex Bit
7	3/8" Drive 1/8" Hex Bit
8	3/8" Drive 3/16" Hex Bit
9	3/8" Drive 3/8" Hex Bit
10	3/8" Drive 5/16" Hex Bit



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A125. Screwdriver Attachment Set, Metric, Hex. The set shall contain square drive sockets for metric socket head fasteners that range from 4 to 17 mm. Items are listed below:

#	Description
1	3/8" Drive 10mm Metric Socket Hex Bit
2	3/8" Drive 9mm Metric Hex Bit
3	3/8" Drive 4mm Metric Socket Hex Bit
4	3/8" Drive 6mm Metric Socket Hex Bit
5	3/8" Drive 5mm Metric Socket Hex Bit
6	3/8" Drive 7mm Metric Socket Hex Bit
7	3/8" Drive 8mm Metric Socket Hex Hex Bit
8	1/2" Drive 12mm Metric Hex Bit
9	1/2" Drive 14mm Metric Hex Bit
10	1/2" Drive 17mm Metric Hex Bit



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A126. Screwdriver Set, Jewelers'. The set shall consist of six swivel-knob jewelers' screwdrivers. The set shall have one each of 1.5 mm, 2 mm, 2.5mm and 3mm flat-tip, and one each #00, #0, and #1 cross tip.



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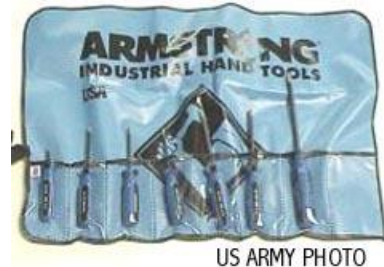
A127. Screwdriver Set. Set shall consist of the following items:

Components		
Offset Screwdrivers, Flat Tip		
	Size	Overall Length (Nominal)
1	5/32"	3"
2	1/4"	4"
3	5/16"	5"
4	3/8"	6"
Offset Screwdrivers, Cross Tip		
5	#1 & #2	4-1/2"
6	#3 & #4	6-1/2"
Stubby Screwdrivers, Flat Tip		
7	3/16"	3"
8	1/4"	3-1/2"
Stubby Screwdriver, Cross Tip		
9	#2	3-1/2"
Round Shank Screwdrivers, Cross Tip		
10	#4	13-1/2"
11	#4	13-1/2"
Square Shank Screwdrivers, Flat Tip		
12	3/8"	17-1/2"
13	3/8"	17-1/2"



A128. Screwdriver Set, Torx. The set shall contain torx screwdrivers. Items are listed below:

Components		
	Size	Blade Length
1	T10	3"
2	T15	3"
3	T15	1-1/4"
4	T20	3"
5	T25	3"
6	T27	4"
7	T30	4"
8	T40	6"



A129. Sharpener, Drill, Portable. Shall be a 120 Volt 60Hz electrical sharpener for drill bits sizes 3/32" through 3/4" (2.5mm – 19mm) and all metric, number, and letter size drill bits of equivalent size. Shall sharpen conventional, split point, and masonry point styles. Grinding

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wheel angle shall be adjustable. The sharpener shall be capable of sharpening high-speed steel, cobalt, and carbide drill bits. (Photo not available.)

A130. Shears, Bent Trimmer. Shall be approximately 12" long, either one beveled blade end and one sharp pointed blade end, or both blade ends sharp pointed.



A131. Sling, Engine and Transmission, 3 Ton. Shall be an adjustable-attitude lifting sling with a 6000 lb rated capacity, a self-locking tilt adjustment mechanism, and a lifting eye with a 1-5/8" inside diameter. The sling width shall be adjustable from 30" to 46" and the angle of the sling relative to the horizontal plane shall be adjustable from 0 to thirty degrees in both directions. The sling shall be provided with a chain hook at each end. The sling shall also be provided with two 5/16" chains, each at least two feet long and having an eye hook on one end.



A132. Sling, Engine and Transmission, 2 Ton. Shall be an adjustable-attitude lifting sling with 4000 lb rated capacity, a self-locking tilt adjustment mechanism, and a lifting eye with a 1-5/8" inside diameter. The sling shall adjust the tilt relative to the horizontal of the object being lifted by shifting the position of a 5/16" chain. The chain shall be provided with eyehooks on each end with throat openings of not less than 1 inch. The total length of the chain with hooks shall be not less than 65-3/4".



A133. Socket Set, Socket Wrench, 3/8" Drive, Metric, Universal. Shall consist of a set of fifteen 6-point sockets with integral universal (flex) joint in the following sizes: 7mm, 8mm, 10mm, 11mm, 12mm, 13mm, 14mm, 15mm, 16mm, 17mm, 18mm, 19mm, 21mm, 22mm, and 24mm. (Photo not available.)

A134. Socket Set, Socket Wrench, 3/8" Drive, Inch, Universal. Shall consist of a set of seven 6-point sockets with integral universal (flex) joint in the following sizes: 3/8", 7/16", 1/2", 9/16", 5/8", 11/16", and 3/4". (Photo not available.)

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A135. Socket Set, Socket Wrench, 3/4" Drive, Inch, Regular. Shall consist of the items listed below.

#	Description
1	Ratchet handle, length 17" min
2	Sliding T-handle, length 17" min – 20" max
3	Extension, length 4.5" min – 5.5" max
4	Extension, length 7.5" min – 8.5" max
5	Extension, length 15" min – 17" max
6	Universal Joint
7	Adapter, 3/4" drive to 1/2" drive
8	Socket, 7/8"
9	Socket, 15/16"
10	Socket, 1"
11	Socket, 1-1/16"
12	Socket, 1-1/8"
13	Socket, 1-1/4"
14	Socket, 1-5/16"
15	Socket, 1-3/8"
16	Socket, 1-7/16"
17	Socket, 1-1/2"
18	Socket, 1-9/16"
19	Socket, 1-5/8"
20	Socket, 1-11/16"
21	Socket, 1-3/4"
22	Socket, 1-13/16"
23	Socket, 1-7/8"
24	Socket, 2"
25	Socket, 2-1/16"
26	Socket, 2-1/8"
27	Socket, 2-3/16"



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28	Socket, 2-1/4"
29	Socket, 2-3/8"

A136. Socket Set, Impact Wrench, 1/2" Drive, Metric, Universal. Shall consist of a set of ten 6-point sockets with integral universal (flex) joint in the following sizes: 13mm, 14mm, 15mm, 16mm, 17mm, 18mm, 19mm, 21mm, 22mm, and 24mm. (Photo not available.)

A137. Socket Set, Impact Wrench, 1/2" Drive, Inch, Universal. Shall consist of a set of eight 6-point sockets with integral universal (flex) joint in the following sizes: 1/2", 9/16", 5/8", 11/16", 3/4", 13/16", 7/8", and 15/16". (Photo not available.)

A138. Socket Set, Impact Wrench, 3/4" Drive, Inch. Shall consist of the items listed below:

#	Description
1	Impact Socket, Regular, 1-1/2"
2	Impact Socket, Regular, 1-9/16"
3	Impact Socket, Regular, 1-5/8"
4	Impact Socket, Regular, 1-11/16"
5	Impact Socket, Regular, 1-3/4"
6	Impact Socket, Regular, 1-13/16"
7	Impact Socket, Regular, 1-7/8"
8	Impact Socket, Regular, 1-15/16"
9	Impact Socket, Regular, 2"
10	Impact Socket, Long, 4 Point, 13/16"
11	Impact Socket, Long, Budd Wheel, Double Opening, 1-1/2" 6 Point & 13/16" 4 Point



A139. Socket Set, Master, Socket Wrench, 1/4",



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3/8", and 1/2" Drive. Shall consist of the items listed below.

#	Description
	<b>Accessories, 1/4" Drive</b>
1	Ratchet Handle, length 4.375", minimum
2	Extension, length 2.5" to 3.5"
3	Extension, length 5.5" to 6.5"
4	Extension, length 9.5" to 10.5"
5	Universal Joint, length 1.5", maximum
	<b>Sockets, 1/4" Drive, 6-Point, Regular</b>
6	1/8"
7	5/32"
8	3/16"
9	7/32"
10	1/4"
11	9/32"
12	5/16"
13	11/32"
14	3/8"
15	7/16"
16	1/2"
17	9/16"
18	4mm
19	4.5mm
20	5mm
21	5.5mm
22	6mm
23	7mm
24	8mm
25	9mm
26	10mm

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27	11mm
28	12mm
29	13mm
30	14mm
31	15mm
	<b>Sockets, 1/4" Drive, 6-Point, Long</b>
32	1/8"
33	5/32"
34	3/16"
35	7/32"
36	1/4"
37	9/32"
38	5/16"
39	11/32"
40	3/8"
41	7/16"
42	1/2"
43	9/16"
44	4mm
45	4.5mm
46	5mm
47	5.5mm
48	6mm
49	7mm
50	8mm
51	9mm
52	10mm
53	11mm
54	12mm
55	13mm
56	14mm



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57	15mm
	<b>Accessories, 3/8" Drive</b>
58	Ratchet Handle, length 5.75" minimum
59	Extension, length 1.5" - 2.5"
60	Extension, length 2.5" – 3.5"
61	Extension, length 5.5" – 6.5"
62	Extension, length 9.5" – 10.5"
63	Universal Joint, length 2.25", maximum
	<b>Sockets, 3/8" Drive, 6-Point, Regular</b>
64	1/4"
65	5/16"
66	3/8"
67	7/16"
68	1/2"
69	9/16"
70	5/8"
71	11/16"
72	3/4"
73	13/16"
74	7/8"
75	15/16"
76	1"
77	6mm
78	7mm
79	8mm
80	9mm
81	10mm
82	11mm
83	12mm
84	13mm
85	14mm

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86	15mm
87	16mm
88	17mm
89	18mm
90	19mm
91	20mm
92	21mm
93	22mm
94	23mm
95	26mm
	<b>Sockets, 3/8" Drive, 6-Point, Long</b>
96	1/4"
97	5/16"
98	3/8"
99	7/16"
100	1/2"
101	9/16"
102	5/8"
103	11/16"
104	3/4"
105	13/16"
106	7/8"
107	15/16"
108	1"
109	6mm
110	7mm
111	8mm
112	9mm
113	10mm
114	11mm
115	12mm

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116	13mm
117	14mm
118	15mm
119	16mm
120	17mm
121	18mm
122	19mm
123	20mm
124	21mm
125	22mm
126	23mm
127	26mm
	<b>Accessories, ½” Drive</b>
128	Ratchet Handle, length 9.5”, minimum
129	Extension, length 1.5” - 3”
130	Extension, length 2.5” – 3.5”
131	Extension, length 5.5” – 6.5”
132	Extension, length 9.5” – 10.5”
133	Universal Joint, length 2.875” maximum
134	Stud Remover, 5/16” – ¾” Capacity
	<b>Sockets, ½” Drive, 6-Point, Regular</b>
135	3/8”
136	7/16”
137	½”
138	9/16”
139	5/8”
140	11/16”
141	¾”
142	13/16”
143	7/8”
144	15/16”

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145	1"
146	1-1/16"
147	1-1/8"
148	1-3/16"
149	1-1/4"
150	1-5/16"
151	1-3/8"
152	1-7/16"
153	1-1/2"
154	9mm
155	10mm
156	11mm
157	12mm
158	13mm
159	14mm
160	15mm
161	16mm
162	17mm
163	18mm
164	19mm
165	21mm
166	22mm
167	23mm
168	24mm
169	25mm
170	26mm
171	27mm
172	28mm
173	29mm
174	30mm
175	32mm

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176	36mm
	<b>Sockets, ½” Drive, 6-Point, Long</b>
177	3/8”
178	7/16”
179	½”
180	9/16”
181	5/8”
182	11/16”
183	¾”
184	13/16”
185	7/8”
186	15/16”
187	1”
188	1-1/16”
189	1-1/8”
190	1-3/16”
191	1-1/4”
192	1-5/16”
193	1-3/8”
194	1-7/16”
195	1-1/2”
	<b>Sockets, ½” Drive, 12-Point, Regular</b>
196	19/32”
197	21/32”
198	25/32”
	<b>Sockets, ½” Drive, 12-Point, Long</b>
199	10mm
200	11mm
201	12mm
202	13mm
203	14mm

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204	15mm
205	16mm
206	17mm
207	18mm
208	19mm
209	20mm
210	21mm
211	22mm
212	23mm
213	24mm
214	25mm
215	26mm
216	27mm
217	28mm
218	29mm
219	30mm
220	32mm
	<b>Socket Wrench Drive Adapters</b>
221	3/8" Male – 1/4" Female
222	1/4" Male - 3/8" Female
223	1/2" Male - 3/8" Female
224	3/8" Male – 1/2" Female
225	3/4" Male – 1/2" Female

A140. Socket Set, Socket Wrench, Wheel Bearing Locknut. The set shall consist of 6 point, 3/4" drive sockets, sizes 2-3/32", 2-3/8", 2-9/16", 3", 3-1/4", 3-1/2", 3-7/8", 4", 4-1/8", 4-3/8", 4-7/8"; and 8 point, 3/4" drive sockets, sizes 2-3/8", 2-9/16", 3", 3-1/4", 3-1/2", 3-7/8", 4-



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3/8" and 4-7/8".

A141. Socket Set, Impact Wrench, Metric, 3/4" Drive, Regular. Shall be a set of impact sockets, sizes 17mm, 19mm, 20mm, 22mm, 24mm, 27mm, 30mm, 31mm, 34mm, 36mm, 38mm, 40mm and 46mm.



A142. Soldering Gun. Shall be a trigger-controlled, pistol-style electrically heated soldering gun with a variable output of 150 to 400 watts and a maximum tip temperature of 1000 degrees F. Shall operate on 120 Volt, 60 Hz current. Shall have a 1/4" pyramid tip. Shall have a built-in light to illuminate the work surface. Storage case shall be included.



A143. Splitting Tool, Nut. Shall split nuts from 5/16" to 7/8" across the flats with no damage to threads. Shall have a steel forged frame and hardened cutter.



A144. Tape, Measuring, 25'. Shall have an ergonomic design and a blade width of at least 1". Tape shall be graduated in English at 1/16" intervals and shall be labeled at inch marks.



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A145. Test Kit, Radiator Pressure. Shall be a kit for pressure-testing vehicle radiator caps and radiators to detect leaks. Kit shall include a manual air pump with a pressure gage and a hose (nominal 12" length) attached to a test head, and an adapter for attaching the test head to truck radiators with "B" size (2-11/16" OD) filler necks.



A146. Tester, Antifreeze Solution. Shall be an optical hydrometer calibrated for determining anti-freeze solution strength on a scale of 0 to -50 degrees F freeze protection; and battery electrolyte specific gravity with scale regions annotated as "Good," "Fair," and "Recharge." Shall include a squeeze bulb syringe and a dipstick for obtaining samples.



A147. Tool Kit, Blind Fastener Installation. Shall include a hand hydraulic riveter, a pneumatic riveter (with 3/8" male quick disconnect fitting), and a cordless electric riveter (with battery pack and charger); that each provides a minimum pull force of 4000 lbs over a stroke of at least 0.625". The kit shall have the capability and fittings to install: Cherrymax® and Huck® clinch rivets from 3/32" to 1/8"; pop rivets 1/8" through 1/4"; 1/4" automotive split ("T") rivets; 3/16" and 1/4" Monobolts®; 3/16" and 1/4" Bulb-Tite® fasteners; 1/8", 5/32", and 3/16" NASA 1400A and 1900S fasteners; 5/32" and 3/16" MS90353 fasteners; and pull-thru nut plate rivets and blind rivet nuts (Rivnut®), thread sizes 5 MM, 6 MM, 8 MM, 10 MM, 6-32, 8-32, 10-32, 10-24, 1/4-20, 1/4-28, 5/16-18, 5/16-24 and 3/8-16. The kit shall also include adapters for right angle and offset pulling that are interchangeable with the straight pull heads of all three riveters. A carrying case shall be included. (Photo not available)

A148. Tool Kit, Cutting, Abrasive, Pneumatic. Pneumatic cut-off tool shall have a 3/8" arbor. The lever-actuated pneumatic tool shall have a rear exhaust, a 1/4" NPT air inlet, and a rated speed of 18,000 RPM. The





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kit shall include a 360-degree swivel adapter for the air inlet, a carrying case, and a supply of abrasive blades. A male 3/8" ID quick disconnect fitting shall be installed on each cut-off tool.

A149. Tool Kit, Large Hose End Crimping. The kit shall include tool(s) for fastening crimp-on fittings to hydraulic hoses by means of a rolled crimp. The tool(s) shall be rated for crimping connectors on hydraulic hoses with inside diameters of 0.75" through 1.25" (crimp outside diameters of 1.05" through 1.79"). Storage case shall be included.



A150. Tool Kit, Small Hose End Crimping. The kit shall include tool(s) for fastening crimp-on fittings to hydraulic hoses by means of a rolled crimp. The tool(s) shall be rated for crimping connectors on hydraulic hoses with inside diameters of 0.25" through 0.75" (crimp outside diameters of 0.56" through 1.30"). Storage case shall be included.



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A151. Tool Kit, Screw Insert. The kit shall contain self-tapping threaded inserts for repair of stripped threaded holes in steel and aluminum with a variety of sizes and thread types, both inch and metric, as well as the requisite drill bits and insertion tools. The insertion tools consist of a cap screw and hex jam nut matching the internal threads for each size of insert included in the kit. The kit shall also include a bolt gage, a quantity of tapping fluid, and a carrying case. The kit shall contain the following inserts and drills:

	<b>Insert Thread Sizes</b>	<b>Qty.</b>
	<b>Inch</b>	
1	1/4-20	12
2	1/4-28	6
3	5/16-18	12
4	5/16-24	6
5	3/8-16	12
6	3/8-24	6
7	7/16-14	12
8	7/16-20	6
9	1/2-13	12
10	1/2-20	6
11	9/16-12	6
12	9/16-18	3
13	5/8-11	6
14	3/4-10	6
	<b>Metric</b>	
15	6mm-1.0	12
16	8mm-1.25	12
17	10mm-1.5	12
18	12mm-1.75	12
17	14mm-2	6
	<b>Drill Bits Sizes</b>	
18	23/64"	1
19	S	1
20	29/64"	1
21	7/16"	1
22	17/32"	1
23	39/64"	1
24	19/32"	1
25	45/64"	1
26	11/16"	1
27	25/32"	1



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28	49/64"	1
29	55/64"	1
30	1-1/32"	1
31	1-1/64"	1

A152. Tool Kit, Tire Service. Shall consist of the 23 items listed below: A male 3/8" ID quick disconnect fitting shall be installed on each Air-Hydraulic Pump.

#	Description	QTY
1	Dual Foot Pressure Gauge, 10-150 lbs in 2 lb increments	2
2	4 in 1 Tire Valve Core Repair Tool	1
3	Snap-in Valve Installation Tool	1
4	Valve Fishing Tool	1
5	Screwdriver, Valve Core	1
6	Hammer, 18" Bead Breaker	1
7	Hammer, 32" Bead Breaker	1
8	Tire Iron, 37" Lock ring remover	1
9	Tire Iron, Mount-Demount Spoon, 24"	1
10	Tire Iron, Mount-Demount Spoon, 30"	1
11	Tire Iron, Mount-Demount Tool, 52"	1
12	Tire Iron, Mount-Demount Tool, 49-1/2"	1
13	Tire Iron, Offset Mount Bar 27"	1
14	Bead Breaker, Manual	1
15	Bead Breaker, Hydraulic	1
16	Air-Hydraulic Pump (for bead breaker)	1
17	#2 Reamer 1/4", 9" Long	1
18	Truck Valve Insert Tool, 7 1/4" Long	1



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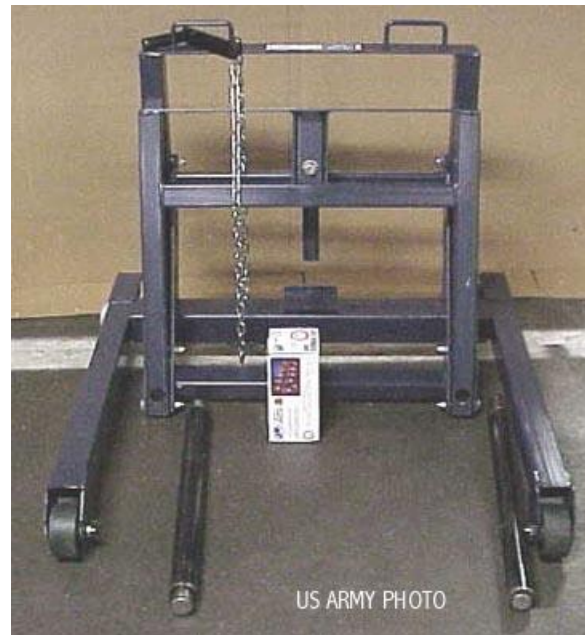
19	Knife, 4" Long	1
20	Tire Tread Depth Gauge	2
21	Carrying Case	1

A153. Trestle, Hoist, Portable, 7-Ton. Shall have an adjustable frame height from 20" or lower when collapsed, to 30" or higher when fully extended. Shall also have the capability of lifting a minimum of 7 tons. (The item depicted has a base roughly 14" by 14" and a collapsed height of 20". Approximate weight is 35 lbs each.)



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A154. Truck, Lift, Wheel. Shall be load rated for 1500 lbs. Shall have a minimum lift travel of 4.75", minimum tilt adjustment of 4 degrees. Shall have a support chain to help secure tires while in transport and removal. Large caster wheels shall be used for added maneuverability. The lifting jack shall be hydraulic. The wheel lift depicted has overall envelope dimensions of roughly 38" wide, 39" front-to-back, and 33" high. Approximate weight is 216 lbs.



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A155. Vise, Machinist's, 4". Shall be a machinist's vise with a swivel base and stationary jaw, a nominal jaw opening of 6" minimum, and a nominal jaw width of 4". Jaw faces shall be replaceable.



A156. Vise, Pipe, Chain-Style. Shall be a chain-style pipe vise with a nominal pipe size capacity of 1/4" - 4".



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A157. Wheel, Abrasive, Fine Grit. Shall be an aluminum oxide straight grinding wheel, fine grit, 7" diameter x 1" thick, with a 0.625" arbor hole (or appropriate adapter). (For use with item A71) **(NOTE: This item is for Production Representative System only.)**



A158. Wheel, Abrasive, Coarse Grit. Shall be an aluminum oxide straight grinding wheel, coarse grit, 7" diameter x 1" thick, with a 0.625" arbor hole (or appropriate adapter). (For use with item A71) **(NOTE: This item is for Production Representative System only.)**



A159. Wheel, Abrasive, Type 27. Shall be a zirconium aluminum Type 27 depressed center grinding disc for use with a right-angle sander/grinder. Shall have a 4-1/2" diameter and a 5/8" arbor hole. (For use with item A117) **(NOTE: This item for Production Representative System only.)**



A160. Wheel, Abrasive, Type 29. Shall be zirconium aluminum disc Type 29 depressed center abrasive flap disk for use with a right-angle sander/grinder. It shall have a 4" diameter and a 5/8" arbor hole. The abrasive shall be 36 grit. (For use with item A117) **(NOTE: This item for Production Representative System only.)**



A161. Wrench, Impact, Electric, 3/4" Square Drive, 400 Ft-Lb. Shall be a reversible electric impact wrench providing a torque of at least 400 ft-lb in the forward direction and 400 ft-lb in reverse. (Photo not available.)

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A162. Wrench Set, Flare Nut, Inch. Shall be a set of 6-point flare nut wrenches as follows

#	Description
1	$\frac{1}{4}$ " x $\frac{5}{16}$ "
2	$\frac{3}{8}$ " x $\frac{7}{16}$ "
3	$\frac{1}{2}$ " x $\frac{9}{16}$ "
4	$\frac{5}{8}$ " x $\frac{11}{16}$ "
5	$\frac{3}{4}$ " x $\frac{13}{16}$ "
6	$\frac{3}{4}$ " x 1"
7	$\frac{7}{8}$ " x 1- $\frac{1}{8}$ "



A163. Wrench Set, Box, Inch. Shall be a set of 12-point box end wrenches as follows:

#	Description
1	$\frac{3}{8}$ " x $\frac{7}{16}$ "
2	$\frac{7}{16}$ " x $\frac{1}{2}$ "
3	$\frac{1}{2}$ " x $\frac{9}{16}$ "
4	$\frac{9}{16}$ " x $\frac{5}{8}$ "
5	$\frac{5}{8}$ " x $\frac{11}{16}$ "
6	$\frac{11}{16}$ " x $\frac{3}{4}$ "
7	$\frac{3}{4}$ " x $\frac{13}{16}$ "
8	$\frac{7}{8}$ " x $\frac{15}{16}$ "
9	$\frac{15}{16}$ " x 1"
10	1" x 1- $\frac{1}{16}$ "
11	1- $\frac{1}{16}$ " x 1- $\frac{1}{4}$ "
12	1- $\frac{1}{8}$ " x 1- $\frac{3}{16}$ "
13	1- $\frac{1}{4}$ " x 1- $\frac{5}{16}$ "
14	1- $\frac{3}{8}$ " x 1- $\frac{7}{16}$ "
15	1- $\frac{1}{2}$ " x 1- $\frac{5}{8}$ "





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A164. Wrench Set, Box, Metric. Shall be a set of 12-point box end wrenches as follows.

#	Description
1	10mm x 11mm
2	12mm x 14mm
3	13mm x 15mm
4	14mm x 15mm
5	16mm x 18mm
6	17mm x 19mm
7	18mm x 21mm
8	19mm x 22mm
9	22mm x 24mm
10	27mm x 30mm
11	30mm x 32mm



A165. Wrench Set, Combination, Inch. Shall be a set of combination open end and box end wrenches as follows:

#	Description
1	1/4"
2	5/16"
3	3/8"
4	7/16"
5	1/2"
6	9/16"
7	5/8"
8	11/16"
9	3/4"
10	13/16"
11	7/8"
12	15/16"



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13	1"
14	1-1/16"
15	1-1/8"
16	1-1/4"
17	1-5/16"
18	1-3/8"
19	1-7/16"
20	1-1/2"
21	1-5/8"
22	1-11/16"
23	1-3/4"
24	1-13/16"
25	1-7/8"
26	2"



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A166. Wrench Set, Combination, Metric. Shall be a set of combination open end and box end wrenches as follows:



#	Description
1	7mm
2	8mm
3	9mm
4	10mm
5	11mm
6	12mm
7	13mm
8	14mm
9	15mm
10	16mm
11	17mm
12	18mm
13	19mm
14	20mm
15	21mm
16	22mm
17	23mm
18	24mm
19	25mm
20	26mm
21	27mm
22	28mm
23	29mm
24	30mm
25	32mm

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26	36mm
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A167. Wrench Set, Open-End, Metric. Shall be a set of open-end wrenches as follows:

#	Description
1	6mm x 8mm
2	7mm x 9mm
3	10mm x 11mm
4	12mm x 14mm
5	13mm x 15mm
6	16mm x 18mm
7	17mm x 19mm
8	20mm x 22mm
9	21mm x 23mm
10	22mm x 24mm
11	24mm x 26mm
12	25mm x 27mm
13	28mm x 30mm
14	30mm x 32mm



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A168. Wrench Set, Open End, Inch. Shall be a set of open end wrenches as follows:

#	Description
1	3/8" x 7/16"
2	7/16" x 1/2"
3	1/2" x 9/16"
4	5/8" x 3/4"
5	11/16" x 3/4"
6	13/16" x 7/8"
7	15/16" x 1"
8	1-1/16" x 1-1/8"
9	1-1/4" x 1-5/16"
10	1-3/8" x 1-7/16"
11	1-1/2" x 1-5/8"
12	1-11/16" x 1-13/16"
13	1-7/8" x 2"



A169. Wrench Set, Flare Nut, Metric. Shall be a set of six flare nut wrenches as follows.

#	Description
1	9mm x 11mm
2	10mm x 12mm



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3	13mm x 14mm
4	15mm x 17mm
5	16mm x 18mm
6	19mm x 21mm

**A170. Wrench Set, Master, Impact Wrench, 3/8" & 1/2"**

**Drive.** Shall be a set of one 1/2" square drive electric impact wrench and one 1/2" square drive pneumatic impact wrench with sockets and accessories. The pneumatic impact wrench shall be reversible; and shall have 1/4" NPT inlet, a handle exhaust, and a maximum rated output of 400 ft-lbs in the forward direction and 600 ft-lb in reverse. A male 3/8" ID quick disconnect fitting shall be installed on each pneumatic impact wrench. The electric impact wrench shall be reversible, shall operate on 120 Volt, 60 Hz, single-phase current, and shall have a rated output of 300 ft/lbs of torque in both directions. The sockets and accessories to be included are as follows:



#	Description
	<b>Impact Sockets, 3/8" Drive, 6-Point, Regular</b>
1	1/4"
2	5/16"
3	3/8"
4	7/16"
5	1/2"
6	9/16"
7	5/8"
8	11/16"
9	3/4"
10	10 mm
11	11 mm
12	12 mm
13	13 mm
14	14 mm

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15	15 mm
16	16 mm
17	17 mm
18	18 mm
19	19 mm
	<b>Impact Sockets, 3/8" Drive, 6-Point, Long</b>
20	1/4"
21	5/16"
22	3/8"
23	7/16"
24	1/2"
25	9/16"
26	5/8"
27	11/16"
28	3/4"
29	10 mm
30	11 mm
31	12 mm
32	13 mm
33	14 mm
34	15 mm
35	16 mm
36	17 mm
37	18 mm
38	19 mm
	<b>Accessories, 3/8" Square Drive</b>
39	Extension Bar, length 2.5" – 3.5"
40	Extension Bar, length 5.5" – 6.5"
41	Universal Joint, length 2.5" maximum
	<b>Impact Sockets, 1/2" Drive, 6-Point,</b>

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	<b>Regular</b>
42	3/8"
43	7/16"
44	1/2"
45	9/16"
46	5/8"
47	11/16"
48	3/4"
49	13/16"
50	7/8"
51	15/16"
52	1"
53	1-1/16"
54	12 mm
55	13 mm
56	14 mm
57	15 mm
58	16 mm
59	17 mm
60	18 mm
61	19 mm
62	21 mm
63	22 mm
64	24 mm
65	27 mm
	<b>Impact Sockets, 1/2" Drive, 6-Point, Long</b>
66	3/8"
67	7/16"
68	1/2"
69	9/16"

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70	5/8"
71	11/16"
72	3/4"
73	13/16"
74	7/8"
75	15/16"
76	1"
77	1-1/16"
78	12 mm
78	13 mm
80	14 mm
81	15 mm
82	16 mm
83	17 mm
84	18 mm
85	19 mm
86	21 mm
87	22 mm
88	24 mm
89	27 mm
	<b>Accessories, 1/2" Square Drive</b>
90	Extension Bar, length 2.5" – 3.5"
91	Extension Bar, length 5.5" – 6.5"
92	Extension Bar, length 9.5" – 10.5"
93	Universal Joint, length 3.063" maximum
94	3/8" Male to 1/2" Female Square Drive Adapter
	<b>Other 1/2" Square Drive Tools</b>
95	3/4" x 13/16" Double-end Socket

A171. Wrench Set, Impact Socket, 3/4" Drive, Inch. Shall be a set of standard-length 6-point, 3/4" drive impact



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sockets.

#	Description
1	Extension Bar, length 6.5" – 7.5"
2	Extension Bar, length 12.5" – 13.5"
3	Socket, 9/16"
3	Socket, 5/8"
4	Socket, 11/16"
5	Socket, 3/4"
6	Socket, 13/16"
7	Socket, 7/8"
8	Socket, 1"
9	Socket, 1-1/16"
10	Socket, 1-1/8"
11	Socket, 1-1/4"
12	Socket, 1-5/16"
13	Socket, 1-7/16"
14	Socket, 1-1/2"

A172. Wrench, Adjustable, 18". Shall be a standard opening adjustable wrench with an 18" nominal length, a 0 - 2-1/16" jaw capacity, a black oxide finish. (Reference ASME B107.8, Type I, Class 2)



A173. Wrench, Adjustable, Automotive, 15". Shall have a worm drive adjustment. Jaws shall be perpendicular to the handle. The wrench shall have a nominal length of 15", a 0 – 3- 5/8" jaw capacity, and a depth of opening of at least 1-3/4".





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A174. Wrench, Adjustable, 10". Shall be a standard opening adjustable wrench with a 10" nominal length, a 1-1/8" jaw capacity, a black oxide finish. (Reference ASME B107.8, Type I, Class 2)



A175. Wrench, Adjustable, Automotive, 18". Shall have a worm drive adjustment. Jaws shall be perpendicular to the handle. The wrench shall have a nominal length of 18", a 0 - 4-3/8" jaw capacity, and a depth of opening of at least 2".



A176. Wrench, Oil Filter. Shall be a pliers-style wrench for truck oil filters with a slip-joint handle providing a jaw opening range of 3-5/8" to 6". The jaws shall be provided with teeth to provide a positive grip, and the handles shall be cushioned.



A177. Wrench, Oil Filter, Strap. Shall be a strap-type wrench. Shall have a non-absorbent, elastomer-coated fabric strap that is impervious to damage from petroleum products and will fit all spin-on filters up to 6 inches in diameter. (Photo not available.)

A178. Wrench, Pipe, 18". Shall be a standard pipe wrench for pipes 1" to 2" in diameter. It shall have an overall length of 18" minimum when opened.



A179. Wrench, Pipe, 10". Shall be a standard pipe wrench for pipes 1/4" to 1" in diameter. It shall have an overall length of 10" minimum when opened.



A180. Wrench Kit, Ratchet, Pneumatic, 3/8" Drive. Shall produce at least 45 ft-lb max torque, and shall be provided with a 1/2" square drive attachment, a 1/4" hex bit attachment, 2 slotted screwdriver hex bits, 2 cross-tip screwdriver hex bits, and a carrying case. A male 3/8" ID quick disconnect fitting shall be installed on each ratchet wrench. (Photo not available)

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A181. Wrench, Torque, Dial, 1/4" Drive, 30 In-Lb. Shall be a rigid housing style torque-indicating wrench with a plain dial. The dial indicator shall show torque when applied in both the clockwise and counterclockwise directions using a pointer and indicator plate, and memory follower indicator to display maximum applied torque. The wrench torque capacity shall be from 0 to 30 inch-pounds. The wrench shall have a 1/4" square male drive, a non-ratcheting head, and a scale marked in increments of 1 inch-pounds. It shall conform to ANSI B107.14, Type 1, Class B, and Style 3.



A182. Wrench, Torque, Dial, 3/8" Drive, 300 In-Lb. Shall be a rigid housing style torque-indicating wrench with a plain dial. The dial indicator shall show torque when applied in both the clockwise and counterclockwise directions using a pointer and indicator plate. The wrench torque capacity shall be from at least 60 to 300 inch-pounds or more. The wrench shall have a 3/8" square male drive, a non-ratcheting head, and a scale marked in increments of 5 inch-pounds. It shall conform to ANSI B107.14, Type 1, Class B, and Style 1.



A183. Wrench, Torque, Click, Ratcheting, 3/4" Drive, 600 Ft-Lb. Shall be a ratcheting click style torque-setting wrench with a micrometer dial. The torque wrench shall indicate via audible, tactile, and visual signal that the applied torque in either the clockwise or counterclockwise direction has reached the preset torque value. The wrench torque range shall be from at least 120 to 600 foot-pounds or more. The wrench shall have a reversible ratcheting head, a 3/4" square male drive, and a micrometer scale marked in 10 foot-pound increments. It shall conform to ANSI B107.14, Type 2, Class A, Style 2, and Design A.



A184. Wrench, Torque, Click, Ratcheting, 3/8" Drive, 75 Ft-Lb. Shall be a ratcheting click style torque-setting wrench with a micrometer dial. The torque wrench shall indicate via audible

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and tactile signal that the applied torque in either the clockwise or counterclockwise direction has reached the preset torque value. The wrench torque range shall be from at least 15 to 75 foot-pounds or more. The wrench shall have a reversible ratcheting head, a 3/8" square male drive, and a micrometer scale marked in 0.5 foot-pound increments. It shall conform to ANSI B107.14, Type 2, Class A, Style 2, and Design A.



A185. Wrench, Torque, Click, 1/2" Drive, 345 Nm. Shall be a click style torque-setting wrench with a micrometer dial marked in both INCH and Metric scales. The torque wrench shall indicate via audible and tactile signal that the applied torque in the clockwise direction has reached the preset torque value. The wrench torque shall be settable from at least 50 to 250 foot-pounds or more and at least 70 to 345 Newton/meters or more. The wrench shall have a 1/2" square male drive, a non-ratcheting head, and a setting scale marked in increments of 1 foot-pound. It shall conform to ANSI B107.14, Type 2, Class A, and Style 1, Design B.



A186. Wrench, Torque, Click, 1/2" Drive, 250 Ft-Lb. Shall be a click style torque-setting wrench with a micrometer dial. The torque wrench shall indicate via audible and tactile signal that the applied torque in either the clockwise or counterclockwise direction has reached the preset torque value. The wrench torque setting range shall be from at least 50 to 250 foot-pounds or more. The wrench shall have a non-ratcheting head, a 1/2" square male drive, and a micrometer scale marked in 1 foot-pound increments. It shall conform to ANSI B107.14, Type 2, Class A, Style 1, and Design A.



A187. Wrench, Wheel Stud Nut, Geared Socket. Shall be a geared socket wrench for removing heavy-duty wheel stud nuts from truck rims. It shall have a double-end socket fitting hexagonal nuts 1-1/2" across flats and square nuts 13/16" across flats. It shall have a solid bar handle 3/4" in diameter and 20.5 inches long, and a tubular extension handle 1-1/8" diameter by 34.5 inches long.



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A188. Bar, Torque Wrench. Shall be designed to provide reaction force for a torque multiplier (for use with item A192). The Bar shall have a tubular handle with bar extension that is adjustable from 12" to 34". It shall be able to withstand a force of at least 2400 foot-pounds at a reaction distance of 6" and at least 450 foot-pounds at a reaction distance of 32 inches.



A189. Die set, Metal Stamping, Hand, Alphabetic. Shall be a set of dies for hand-stamping alphabetic characters into metal. The set shall contain 27 dies, providing the complete alphabet in gothic uppercase letters, plus an ampersand, with a character height of 0.188 inches. A carrying case shall be included.



A190. Die Set, Metal Stamping, Hand, Alphabetic and Numeric. Shall be a set of dies for hand-stamping numeric and alphabetic characters into metal. The set shall contain 36 dies, providing the complete alphabet in gothic uppercase letters, the numbers 0 through 8, and an ampersand, with a character height of 0.188 inches. A carrying case shall be included.



A191. Gage Stock Set, Thickness. The set shall be comprised of steel feeler stock that is 12" long and 1/2" wide. It shall contain one blade each of the following thickness: 0.0015", 0.002", 0.003", 0.004", 0.005", 0.006", 0.007", 0.008", 0.010", and 0.015".



A192. Multiplier, Torque, Crank-Operated. The multiplier shall be rated at 1200 lbs of torque. The rated torque output is applicable in both the clockwise and counterclockwise direction. Multiplier shall consist of a metal housing with gear multiplier, torque reaction device, protractor with pointer and display of output torque. Multiplier shall have 3/8" female square drive input and a 3/4" female square drive output. The maximum rated input torque to develop rated output torque is 15ft-lb. The display shall be accurate within plus and minus 2% of actual output torque from 20% of rated maximum torque to the rated maximum torque. The protractor shall be marked from 0 to 180 degrees, graduated in 1-degree increments. It shall be able to





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operate in temperatures from -25 to 125 degrees F. It shall have 3/8" male input crank. Shall have a carrying case and a set of instructions.

A193. Plate, Bolster, 36 x 36. Shall be suitable for use as cribbing under a 30-ton bottle jack when used on unpaved surfaces. The bolster plates shall be fabricated of material with sufficient durability, strength, rigidity, and resilience to withstand their rated loads without fracturing, splintering, or permanently deforming when the loads are imposed on a frequent and long-term basis at any and all temperatures from -25 °F to +125 °F. The material shall neither absorb nor be subject to damage from water, petroleum products, and detergents; and shall neither be damaged by nor support the growth of fungus and mildew. The material shall not corrode, and shall be resistant to damage from ozone and ultraviolet light. The bolster plates shall have a surface area and thickness sufficient to distribute their rated loads to an average value of 50 pounds or less per square inch (approximately 3' x 3'). The bolster plates shall be provided with handhold opening(s) at least 6" x 3" to provide a secure grasp while wearing winter gloves as well as with the unprotected hand. (Photo not available.)

A194. Pliers, Multiple Position. Shall be adjustable joint, angle nose pliers with multiple grooves and tongue and straight, serrated jaws. The pliers shall have a nominal 12" length, capacity from 0 to 2.125" inch jaw opening with at least five adjustment positions, and cushioned grips. Shall conform to ASME B107.23, Type I, Class 1, Style A.



A195. Pliers, Multiple Position, Electrical Connector. Shall be slip joint pivot type pliers with knurled or serrated handles, and insert type jaw pads. The slip joint pivot shall have at least three notched positions. The pliers shall have a minimum overall length of 8.75" and shall grip circular connectors with 3/4" to 2-1/2" diameters.



A196. Puller Kit, Universal. Shall be a light duty kit for installing and removing bearings, bushings, and driver plugs with engaging threaded adapters. The kit shall consist essentially of a threaded shaft, a housing, a tension nut, two tension nut handles, two adapter sleeves,



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a thrust bearing, nine engaging threaded adapters, and a puller attachment. The engaging threaded adapters shall provide the capability to install and remove bearings and bushings having inside diameters from 1/2" to 1-1/16". The puller attachment shall provide the capability to remove blind hole bearings and bushings having inside diameters from 1/2" to 1-1/2 inches. Storage case shall be included.

A197. Socket Set, Socket Wrench, 3/4" Drive, Inch, Regular. Shall consist of the items listed below.

#	Description
1	Ratchet handle, length 17" min
2	Sliding T-handle, length 17" min – 20" max
3	Extension, length 4.5" min – 5.5" max
4	Extension, length 7.5" min – 8.5" max
5	Extension, length 15" min – 17" max
6	Universal Joint
7	Adapter, 3/4" drive to 1/2" drive
8	Socket, 7/8"
9	Socket, 15/16"
10	Socket, 1"
11	Socket, 1-1/16"
12	Socket, 1-1/8"
13	Socket, 1-1/4"
14	Socket, 1-5/16"
15	Socket, 1-3/8"
16	Socket, 1-7/16"
17	Socket, 1-1/2"
18	Socket, 1-9/16"
19	Socket, 1-5/8"
20	Socket, 1-11/16"
21	Socket, 1-3/4"
22	Socket, 1-13/16"
23	Socket, 1-7/8"



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24	Socket, 2"
25	Socket, 2-1/16"
26	Socket, 2-1/8
27	Socket, 2-3/16"
28	Socket, 2-1/4"
29	Socket, 2-3/8"

A198 Wrench, Set, Socket Wrench, 1" Drive, Inch, Regular. Shall include the following:

QTY	Description
1	1-7/16" Socket
1	1-1/2" Socket
1	1-5/8"Socket
1	1-11/16" Socket
1	1-13/16" Socket
1	1-7/8" Socket
1	2" Socket
1	2-1/8" Socket
1	2-3/16" Socket
1	2-1/4" Socket
1	2-3/8" Socket
1	2 1/2" Socket
1	2-9/16" Socket
1	2-5/8" Socket
1	2-3/4" Socket
1	2-13/16" Socket
1	3" Socket
1	3-1/8" Socket
1	Ratchet, Reversible, length 20" min
1	Handle, Hinged, length 22" min
1	Handle, Tee Sliding, length 20" min – 32" max
1	Extension, length 7.5" min – 8.5" max
1	Extension, length 16" min – 18" max



A199. Wrench, Pipe, 36". Shall be a standard pipe wrench with a forged aluminum handle for pipes 2-1/2" to 3-1/2" in diameter. It shall have an overall length of 36" minimum when opened.



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A200. Jack, Bottle, Hydraulic, Hand, 30 Ton. The jack shall be a self-contained unit consisting of a solid plunger and an integral pump, ram and reservoir. The jack shall have a rated load capacity of at least 30 tons. It shall have a minimum extended height 16" and maximum retracted height of 11", and shall be supplied with a removable pump handle.



A201. Blow Gun, Extended, Air. Shall have an extension with a nominal bend of 36-degrees and a nominal length of 48 inches. The blow gun shall be rated for a maximum working pressure of no more than 150 psi, and shall have a 1/4-inch air inlet. The air blow gun shall be supplied with a metal safety tip, with a nominal rating of 10.5 SCFM (standard cubic feet per minute) at 100 psi. The blow-gun shall be compliant with OSHA 1910.95 for noise level and OSHA 1910.242 B for pressure relief."



A202. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 20 Millimeter (20MM) open end wrenching surface with Anti-Slip design.





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A203. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 21MM open end wrenching surface with Anti-Slip design.



A204. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 22MM open end wrenching surface with Anti-Slip design.



A205. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 23MM open end wrenching surface with Anti-Slip design.



A206. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 24MM open end wrenching surface with Anti-Slip design.



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A207. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 25MM open end wrenching surface with Anti-Slip design.



A208. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 15/16 inch open end wrenching surface with Anti-Slip design.



A209. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1 inch open end wrenching surface with Anti-Slip design.



A210. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-1/16 inch open end wrenching surface with Anti-Slip design.

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A211. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-1/8 inch open end wrenching surface with Anti-Slip design.



A212. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-3/16 inch open end wrenching surface with Anti-Slip design.



A213. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-1/4 inch open end wrenching surface with Anti-Slip design.



A214. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-5/16 inch open end wrenching surface with Anti-Slip design.

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A215. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-3/8 inch open end wrenching surface with Anti-Slip design.



A216. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-7/16 inch open end wrenching surface with Anti-Slip design.



A217. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-1/2 inch open end wrenching surface with Anti-Slip design.



A218. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-9/16 inch open end wrenching surface with Anti-Slip design.

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A219. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-5/8 inch open end wrenching surface with Anti-Slip design.



A220. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-11/16 inch open end wrenching surface with Anti-Slip design.



A221. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-3/4 inch open end wrenching surface with Anti-Slip design.



A222. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-13/16 inch open end wrenching surface with Anti-Slip design.

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A223. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 1-7/8 inch open end wrenching surface with Anti-Slip design.



A224. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 2 inch open end wrenching surface with Anti-Slip design.



A225. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 2-1/8 inch open end wrenching surface with Anti-Slip design.



A226. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 2-1/4 inch open end wrenching surface with Anti-Slip design.

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A227. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 2-3/8 inch open end wrenching surface with Anti-Slip design.



A228. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 2-7/16 in open end wrenching surface with Anti-Slip design.



A229. Crowfoot Attachment, Socket Wrench. Shall have 1/2" female square drive with locking hole to keep crowfoot engaged on extension and 2-1/2 inch open end wrenching surface with Anti-Slip design.



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APPENDIX B

COMPONENT LIST  
SATS SUPPLEMENTAL TOOL KIT #1

For the systems that will be used as Production Representative Systems for testing purposes, all components listed in the following table will be provided and space within the container allocated for each component.

For all future delivery orders components listed with Remarks Code 16 or Remarks Code 22, space will be allocated within the container for each item and that location documented, however, the item itself will not be provided.



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#	NOMENCLATURE	UI	QTY	WTY*	RC**
	<b>MODULE #1</b>				
1	RESERVED				
2	DRESSER, ABRASIVE WHEEL	EA	1	C	
3	DRILL, BATTERY OPERATED, RECHARGEABLE, RIGHT ANGLE, 3/8"	EA	1	C	10
4	DRILL-DRIVER, ELECTRIC, 1/2"	EA	1	C	10
5	DRILL-DRIVER, BATTERY OPERATED, RECHARGEABLE	EA	1	C	10
6	DRILL, ELECTRIC, PORTABLE, 3/8"	EA	1	C	10
7	DRILL, ELECTRIC, PORTABLE, 1/2"	EA	1	C	10
8	GOGGLES, INDUSTRIAL	EA	1	N	10
9	GREASE GUN KIT	KT	1	C	
10	GRINDING MACHINE, UTILITY	EA	1	C	10
11	HANDLE, T, WITH EXTENSION	EA	1	C	
12	HOLDER, PUNCH AND CHISEL	EA	1	C	10
13	RESERVED				
14	LIGHT, BATTERY OPERATED, RECHARGEABLE	EA	1	C	10
15	MULTIMETER	EA	1	C	10
16	RESERVED				
17	RESERVED				
18	PLATE, BOLSTER, 40" x 72"	EA	1	N	10
19	PLIERS SET, RETAINING RING	SE	1	L	10
20	PULLER SET, MECHANICAL	SE	1	L	
21	PUNCH & CHISEL SET	SE	1	N	10
22	SCREWDRIVER ATTACHMENT SET, TORX	SE	1	L	
23	SOCKET SET, SOCKET WRENCH, 3/4" DRIVE, INCH	SE	1	L	
24	SOCKET SET, MASTER, SOCKET WRENCH, 1/4", 3/8", AND 1/2" DRIVE	SE	2	L	
25	TRESTLE, HOIST, PORTABLE, 7-TON	PR	2	C	10
26	WHEEL, ABRASIVE, FINE GRIT (NOTE: THIS ITEM FOR PRODUCTION REPRESENTATIVE SYSTEM ONLY)	EA	1	N	22
27	WHEEL, ABRASIVE, COARSE GRIT (NOTE: THIS ITEM FOR PRODUCTION REPRESENTATIVE SYSTEM ONLY)	EA	1	N	22
28	WRENCH SET, COMBINATION, INCH	SE	3	L	
29	WRENCH SET, COMBINATION, METRIC	SE	1	L	
30	WRENCH SET, MASTER, IMPACT WRENCH, 3/8" AND 1/2" DRIVE	SE	1	C	
31	WRENCH, ADJUSTABLE, 10"	EA	2	L	
32	WRENCH, ADJUSTABLE, 18"	EA	2	L	
33	WRENCH KIT, RATCHET, PNEUMATIC, 3/8" DRIVE	EA	1	C	10
34	WRENCH, TORQUE, CLICK, RATCHETING, 3/4" DRIVE, 600 FT-LB	EA	2	C	10,25
35	WRENCH, TORQUE, DIAL, 3/8" DRIVE, 300 IN-LB	EA	1	C	10,25
36	WRENCH, TORQUE, DIAL, 1/4" DRIVE, 30 IN-LB	EA	1	C	10,25

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\* Warranty Column definitions:

L = Lifetime Warranty

C = Commercial Warranty Available

N = No Warranty required

\*\* RC (Remarks Code): For Government use only

**SPECIAL NOTATION:** Components marked with RC 16 or 22 will be provided by the contractor for Production Representative System only for purposes of space allocations, weights and testing. These components will not be included in all other future production sets.

16 = This item is not initially issued as a component of the SKO. The item may be requisitioned "as required" when authorized by the Commanding Officer.

22 = This is a consumable item, non-accountable on hand receipt, not issued with the tool set, quantity established by gaining unit.

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B1. RESERVED

B2. Dresser, Abrasive Wheel. Dresser shall be provided with replaceable cutters, and protective hood.



B3. Drill, Battery Operated, Rechargeable, Right Angle, 3/8". Shall be an 18-volt, battery-operated, 3/8" drill with the following features: trigger-controlled variable speed; dual speed range (No-Load RPM Low: 0 to at least 400 rpm, High: 0 to at least 1000 rpm); forward and reverse operation; and a keyless chuck. The drill shall produce at least 300 in-lbs torque at low speed, and at least 60 in-lbs torque at high speed. Battery and battery charger shall be supplied. Set shall come with a storage case. (Photo not available.)

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B4. Drill, Driver, Electric, 1/2". Shall be a "D" handle drill with a 1/2" keyed jaw chuck. Shall be reversible and have a 120 Volt 60 Hz, single-phase variable speed motor for speeds from 0 to at least 500 RPM. Shall be rated for drilling 1/2" holes in steel. Side handle shall be included.



B5. Drill-Driver, Battery Operated, Rechargeable. Shall be an 18 volt, 2 Amp-Hour battery-operated, 1/2" drill with the following features: trigger-controlled variable speed; dual speed range (No-Load RPM Low: 0 to at least 400 rpm, High: 0 to at least 1000 rpm); trigger lock; forward and reverse operation; and a keyless chuck. For drilling operations, the drill shall produce at least 400 in-lbs torque at low speed and at least 120 in-lbs at high speed. For driving operations, the drill shall be furnished with a multi-position chuck permitting incremental limitation of the output torque over the range of 0 to at least 80 in-lbs. Battery charger shall be supplied. Kit shall come with a storage case.



B6. Drill, Electric, Portable, 3/8". Shall have a 3/8" keyed jaw chuck, pistol grip handle and a variable speed 120 Volt 60 Hz motor for operation from 0 – 1300 RPM. Shall be rated for drilling holes in steel up to 3/8" in diameter. Shall be double insulated and designed for close quarters work. Drill head shall be not more than 4" from front to back, and not more than 2.5" in diameter.



B7. Drill, Electric, Portable, 1/2". Shall have a 1/2" keyed jaw chuck, pistol grip handle and a variable speed 120 Volt 60 Hz motor for operation from 0 – 750 RPM. Shall be rated for drilling holes in steel up to 1/2" in diameter. Shall be double insulated and designed for close quarters work. Drill head shall be not more than 4.5" from front to back, and not more than 2.5" in diameter.



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B8. Goggles, Industrial. Shall be cover goggles, direct ventilation, conforming to ANSI Z87.1. Lens shall be clear and replaceable. The headband shall have a length of at least 18 inches.



B9. Grease Gun Kit. Shall provide the capability to pump lubricating grease from standard 5gallon/35 lb grease containers into standard grease guns and the included portable pressurized lubricating system. The portable lubricating system shall hold at least ten pounds of grease and shall be capable of producing 10,000 psig at the nozzle. Kit shall include the following components:



	Components
1	Grease Filler Pump
2	Grease Gun Filler Attachment
3	Bearing Packer Attachment
4	Transfer/Filler Attachment
5	Mini-Lube System
6	Quick Connect System

B10. Grinding Machine, Utility. Shall be a bench mounted grinder with two spindles having a diameter of 5/8" each. Shall be for grinding wheels with a diameter of 7 inches maximum, and a thickness 1 inch maximum. There shall be a tilted work rest for each wheel. The nominal spindle speed shall be 3450 RPM, and the grinder shall have an integral 115 Volt, 60 Hz, single phase, 0.5 HP motor. Shall be furnished with one coarse grit straight abrasive wheel and one fine grit straight abrasive wheel.



B11. Handle, T, with Extension. Sliding T-handle breaker bar with extension for 1" square drive socket wrenches. The handle shall have an overall length of 29 inches, and the extension an overall length of 36 inches. The extension shall be furnished with a locking



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button.

B12. Holder, Punch and Chisel. Shall be a screw-clamp style holder with a capacity to hold punches and chisels with handles up to 1" in diameter.



B13. RESERVED

B14. Light, Battery Operated, Rechargeable. Shall be an 18-volt, 2 Amp-Hour battery-powered work light. Work light shall have the following features: an on-off switch; a wide-angle fixed beam, a stable base for standing upright on flat surfaces; and a multi-position swivel head which permits the beam direction to be incrementally adjusted from parallel with the handle through an arc of 120 degrees. Battery and battery charger shall be supplied. Kit shall come with a storage case.



B15. Multimeter. Shall be able to measure AC and DC voltage, shall measure resistance in Ohms, shall measure AC and DC current, shall test diodes, and shall have an audible signal for continuity checks. Shall measure average 45 – 1000 Hz AC voltage up to 1000 volts with an accuracy of  $\pm 2\%$  and a display resolution to 1 mV. Shall measure DC voltage up to 1000 volts with an accuracy of  $\pm 3\%$  and a display resolution to one 0.1 mV. Shall measure resistance up to 32 M Ohms with an accuracy of  $\pm 5\%$  and a display resolution to 0.1 Ohm. Shall measure 45 - 1000 Hz AC current up to 10.0 amps with an accuracy of  $\pm 2.5\%$  and a display resolution of 0.01 mA. The multi-meter shall have a four-place digital display, display hold, manual/automatic range selection, and an auto-off mode to conserve battery life. The meter shall be suitable for outdoor use, including a dust and water resistant case, an operating temperature range of 15 – 120 degrees F, and ability to withstand a ten-foot drop. Batteries, heavy-duty test leads, flat-blade probes and a user manual shall be included. (Picture not available)

B16. Multiplier, Torque Wrench. The multiplier shall be rated at 1200 lbs of torque. The rated torque output is applicable in both the clockwise and counterclockwise direction. Multiplier shall consist of a metal housing with gear multiplier, torque reaction





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device, protractor with pointer and display of output torque. Multiplier shall have 3/8" female square drive input and a 3/4" female square drive output. The maximum rated input torque to develop rated output torque is 15ft-lb. The display shall be accurate within plus and minus 2% of actual output torque from 20% of rated maximum torque to the rated maximum torque. The protractor shall be marked from 0 to 180 degrees, graduated in 1-degree increments. It shall be able to operate in temperatures from -25 to 125 degrees F. It shall have 3/8" male input crank. Shall have a carrying case and a set of instructions.

B17. Plate, Bolster, 36 x 36. Shall be suitable for use as cribbing under a 30-ton bottle jack when used on unpaved surfaces. The bolster plates shall be fabricated of material with sufficient durability, strength, rigidity, and resilience to withstand their rated loads without fracturing, splintering, or permanently deforming when the loads are imposed on a frequent and long-term basis at any and all temperatures from -25 °F to +125 °F. The material shall neither absorb nor be subject to damage from water, petroleum products, and detergents; and shall neither be damaged by nor support the growth of fungus and mildew. The material shall not corrode, and shall be resistant to damage from ozone and ultraviolet light. The bolster plates shall have a surface area and thickness sufficient to distribute their rated loads to an average value of 50 pounds or less per square inch (approximately 3' x 3'). The bolster plates shall be provided with handhold opening(s) at least 6" x 3" to provide a secure grasp while wearing winter gloves as well as with the unprotected hand. (Photo not available.)

B18. Plate, Bolster, 40" x 72". Shall be at least 3 feet 4 inches by 6 feet, and suitable for use as cribbing under a 2000 lb capacity transmission lift when used on unpaved surfaces. The bolster plates shall be fabricated of material with sufficient durability, strength, rigidity, and resilience to withstand their rated loads without fracturing, splintering, or permanently deforming when the loads are imposed on a frequent and long-term basis at any and all temperatures from -25 °F to +125 °F. The material shall neither absorb nor be subject to damage from water, petroleum products, and detergents; and shall neither be damaged by nor support the growth of fungus and mildew. The material shall not corrode, and shall be resistant to damage from ozone and ultraviolet light. The bolster plates shall have a surface area and thickness sufficient to distribute their rated loads to an average value of 50 pounds or less per square inch and provide a smooth surface for positioning the jack beneath a vehicle component (approximately 4' x 6'). The bolster plates shall be provided with handhold opening(s) at least 6" x 3" to provide a secure grasp while wearing winter gloves as well as with the unprotected hand. (Photo not available.)

B19. Pliers Set, Retaining Ring. The set shall contain fixed-tip convertible snap-ring pliers for use on internal and external retaining rings. The pliers shall have cushion grip handles. The set shall contain the following items:

	Pliers Tip Diameter	Pliers Tip Configuration
1	.038"	Straight
2	.038"	45 degree



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3	.038"	90 degree
4	.047"	Straight
5	.047"	45 degree
6	.047"	90 degree
7	.070"	Straight
8	.070"	45 degree
9	.070"	90 degree
10	.090"	Straight
11	.090"	45 degree
12	.090"	90 degree
13	Carrying case	

B20. Puller Set, Mechanical. Shall consist of pullers and puller accessories. Shall be rated for a pulling force of at least 10 tons. The puller set shall consist of:

<b>2-Arm Pullers</b>
4" Spread, 3-1/4" Reach
6" Spread, 3-1/4" Reach
9" Spread, 5" Reach
12" Spread, 11" Reach
<b>Bearing Separators</b>
1/4" to 15/16" Capacity
1/8" to 2" Capacity
1/2" to 4-5/8" Capacity
<b>Press-Puller</b>
Frame and forcing screw with 2-1/8" to 7-1/4" Spread
Two Leg Ends
Two 6-3/4" Legs
Two 15-3/4" Legs
Two Leg Connectors
<b>Gear and Pulley Puller</b>
1-1/2" – 4-1/4" Spread, 13" forcing screw





<b>Internal Puller</b>
1-1/2" to 6" Spread, 4" Reach
<b>Steering Wheel Puller</b>
Body with forcing screw
Two Cap Screws 3/8"-16 x 3-1/2"
Two Cap Screws 5/16"-18 x 3-1/2"
Two Cap Screws 5/16"-24 x 3-1/2"
Two Cap Screws 5/16"-24 x 4" (SIR)
Two Cap Screws M8"-1.25 x 90mm
<b>Pittman Arm Puller</b>
2-3/4" Spread, 5-1/2" Reach
<b>Harmonic Balancer Puller</b>
Frame and forcing screw for bolt circle diameters from 1-1/2" to 4-5/8"
Three cap screws 3/8"-24 x 3"
Three cap screws 3/8"-16 x 3"
<b>Side Hammer</b>
2 Leg/3 Leg head with Inside/Outside Legs, 1-1/4" to 4-1/2" Spread, 2-1/2 lb. Hammer
<b>Pilot Bearing Puller</b>
2 Leg Inside Head, 1-1/2" Spread and 3/4" Reach, 1-3/4 Lb. Hammer
<b>Threaded Shaft Adapters</b>
5/8"-18 x 5/8"-18
5/8"-18 x 3/4"-16
5/8"-18 x 7/8"-14
5/8"-18 x 1"-14
5/8"-18 x 1-1/8"-12
5/8"-18 x 1-1/4"-12
<b>Hollow Shaft Adapters</b>
1" x 3/4"
1-1/8" x 7/8"

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1-1/4" x 1"
1-3/8" x 1-1/8"
1-5/8" x 1-1/4"
1-3/4" x 1-3/8"
1-7/8" x 1-1/2"
2" x 1-5/8"
2-1/8" x 1-3/4"
2-3/8" x 1-7/8"
2-1/2" x 2"

B21. Punch and Chisel Set. Shall consist of 26 pieces as listed in the table below:

	Description
1	3/4" Cold Chisel, length 6-1/2" minimum
2	1/4" Cold Chisel, length 4" minimum
3	5/16" Cold Chisel, length 4" minimum
4	3/8" Cold Chisel, length 5" minimum
5	1/2" Cold Chisel, length 5-3/4" minimum
6	5/8" Cold Chisel, length 6" minimum
7	7/8" Cold Chisel, length 7-1/2" minimum
8	1" Cold Chisel, length 8" minimum
9	1-3/16" Cold Chisel, length 9" minimum
10	3/32" Drive Pin Punch
11	1/8" Drive Pin Punch
12	5/32" Drive Pin Punch
13	3/16" Drive Pin Punch
14	7/32" Drive Pin Punch
15	1/4" Drive Pin Punch
16	1/8" Tip Drift Punch, length 8", minimum
17	3/16" Tip Drift Punch, length 8", minimum



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18	1/4" Tip Drift Punch, length 8-1/2", minimum
19	3/32" Tip Starting Punch
20	1/8" Tip Starting Punch
21	3/16" Tip Starting Punch
22	7/32" Tip Starting Punch
23	1/4" Tip Starting Punch
24	#2 (5/16" Body) Center Punch, length 3-1/4" minimum
25	#7 (3/8" Body) Center Punch, length 4" minimum
26	#3 (1/2" Body) Prick Punch, length 5" minimum

B22. Screwdriver Attachment Set, Torx. The set shall contain 1/4" square-drive sockets for Torx sizes T-8, T-10, T-15, T-20, T-25, T-27, and 3/8" square drive sockets for Torx sizes T-30, T-40, T-45, T-47, T-50 and T-55. Sockets shall be two-piece construction. (Picture not available.)

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B23. Socket Set, Socket Wrench, 3/4" Drive, Inch, Regular. Shall consist of the items listed below.



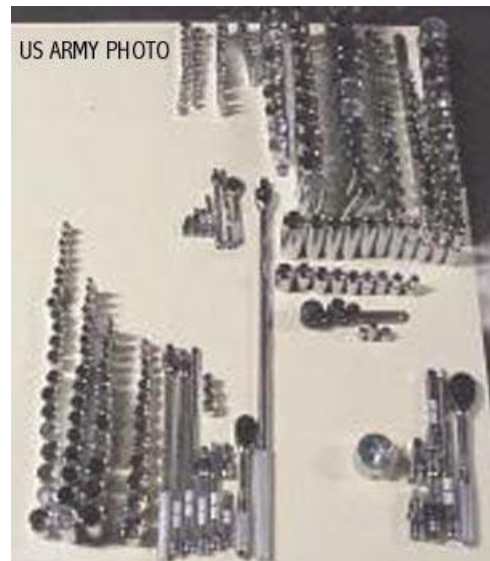
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#	Description
1	Ratchet handle, length 17" min
2	Sliding T-handle, length 17" min – 20" max
3	Extension, length 4.5" min – 5.5" max
4	Extension, length 7.5" min – 8.5" max
5	Extension, length 15" min – 17" max
6	Universal Joint
7	Adapter, 3/4" drive to 1/2" drive
8	Socket, 7/8"
9	Socket, 15/16"
10	Socket, 1"
11	Socket, 1-1/16"
12	Socket, 1-1/8"
13	Socket, 1-1/4"
14	Socket, 1-5/16"
15	Socket, 1-3/8"
16	Socket, 1-7/16"
17	Socket, 1-1/2"
18	Socket, 1-9/16"
19	Socket, 1-5/8"
20	Socket, 1-11/16"
21	Socket, 1-3/4"
22	Socket, 1-13/16"
23	Socket, 1-7/8"

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24	Socket, 2"
25	Socket, 2-1/16"
26	Socket, 2-1/8
27	Socket, 2-3/16"
28	Socket, 2-1/4"
29	Socket, 2-3/8"

B24. Socket Set, Master, Socket Wrench, 1/4", 3/8", and 1/2" Drive. Shall consist of the items listed below.



#	Description
	<b>Accessories, 1/4" Drive</b>
1	Ratchet Handle, length 4.375", minimum
2	Extension, length 2.5" to 3.5"
3	Extension, length 5.5" to 6.5"
4	Extension, length 9.5" to 10.5"
5	Universal Joint, length 1.5", maximum
	<b>Sockets, 1/4" Drive, 6-Point, Regular</b>
6	1/8"
7	5/32"
8	3/16"
9	7/32"
10	1/4"
11	9/32"

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12	5/16"
13	11/32"
14	3/8"
15	7/16"
16	1/2"
17	9/16"
18	4mm
19	4.5mm
20	5mm
21	5.5mm
22	6mm
23	7mm
24	8mm
25	9mm
26	10mm
27	11mm
28	12mm
29	13mm
30	14mm
31	15mm
	<b>Sockets, 1/4" Drive, 6-Point, Long</b>
32	1/8"
33	5/32"
34	3/16"
35	7/32"
36	1/4"
37	9/32"
38	5/16"
39	11/32"
40	3/8"
41	7/16"

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42	½"
43	9/16"
44	4mm
45	4.5mm
46	5mm
47	5.5mm
48	6mm
49	7mm
50	8mm
51	9mm
52	10mm
53	11mm
54	12mm
55	13mm
56	14mm
57	15mm
	<b>Accessories, 3/8" Drive</b>
58	Ratchet Handle, length 5.75" minimum
59	Extension, length 1.5" - 2.5"
60	Extension, length 2.5" – 3.5"
61	Extension, length 5.5" – 6.5"
62	Extension, length 9.5" – 10.5"
63	Universal Joint, length 2.25", maximum
	<b>Sockets, 3/8" Drive, 6-Point, Regular</b>
64	¼"
65	5/16"
66	3/8"
67	7/16"
68	½"
69	9/16"
70	5/8"

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71	11/16"
72	3/4"
73	13/16"
74	7/8"
75	15/16"
76	1"
77	6mm
78	7mm
79	8mm
80	9mm
81	10mm
82	11mm
83	12mm
84	13mm
85	14mm
86	15mm
87	16mm
88	17mm
89	18mm
90	19mm
91	20mm
92	21mm
93	22mm
94	23mm
95	26mm
	<b>Sockets, 3/8" Drive, 6-Point, Long</b>
96	1/4"
97	5/16"
98	3/8"
99	7/16"
100	1/2"



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101	9/16"
102	5/8"
103	11/16"
104	3/4"
105	13/16"
106	7/8"
107	15/16"
108	1"
109	6mm
110	7mm
111	8mm
112	9mm
113	10mm
114	11mm
115	12mm
116	13mm
117	14mm
118	15mm
119	16mm
120	17mm
121	18mm
122	19mm
123	20mm
124	21mm
125	22mm
126	23mm
127	26mm
	<b>Accessories, 1/2" Drive</b>
128	Ratchet Handle, length 9.5", minimum
129	Extension, length 1.5" - 3"
130	Extension, length 2.5" – 3.5"

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131	Extension, length 5.5" – 6.5"
132	Extension, length 9.5" – 10.5"
133	Universal Joint, length 2.875" maximum
134	Stud Remover, 5/16" – 3/4" Capacity
	<b>Sockets, 1/2" Drive, 6-Point, Regular</b>
135	3/8"
136	7/16"
137	1/2"
138	9/16"
139	5/8"
140	11/16"
141	3/4"
142	13/16"
143	7/8"
144	15/16"
145	1"
146	1-1/16"
147	1-1/8"
148	1-3/16"
149	1-1/4"
150	1-5/16"
151	1-3/8"
152	1-7/16"
153	1-1/2"
154	9mm
155	10mm
156	11mm
157	12mm
158	13mm
159	14mm
160	15mm

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161	16mm
162	17mm
163	18mm
164	19mm
165	21mm
166	22mm
167	23mm
168	24mm
169	25mm
170	26mm
171	27mm
172	28mm
173	29mm
174	30mm
175	32mm
176	36mm
	<b>Sockets, ½" Drive, 6-Point, Long</b>
177	3/8"
178	7/16"
179	½"
180	9/16"
181	5/8"
182	11/16"
183	¾"
184	13/16"
185	7/8"
186	15/16"
187	1"
188	1-1/16"
189	1-1/8"
190	1-3/16"

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191	1-1/4"
192	1-5/16"
193	1-3/8"
194	1-7/16"
195	1-1/2"
	<b>Sockets, 1/2" Drive, 12-Point, Regular</b>
196	19/32"
197	21/32"
198	25/32"
	<b>Sockets, 1/2" Drive, 12-Point, Long</b>
199	10mm
200	11mm
201	12mm
202	13mm
203	14mm
204	15mm
205	16mm
206	17mm
207	18mm
208	19mm
209	20mm
210	21mm
211	22mm
212	23mm
213	24mm
214	25mm
215	26mm
216	27mm
217	28mm
218	29mm
219	30mm

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220	32mm
<b>Socket Wrench Drive Adapters</b>	
221	3/8" Male – 1/4" Female
222	1/4" Male - 3/8" Female
223	1/2" Male - 3/8" Female
224	3/8" Male – 1/2" Female
225	3/4" Male – 1/2" Female

B25. Trestle, Hoist, Portable, 7-Ton. Shall have an adjustable frame height from 20" or lower when collapsed, to 30" or higher when fully extended. Shall also have the capability of lifting a minimum of 7 tons. (The item depicted has a base roughly 14" by 14" and a collapsed height of 20". Approximate weight is 35 lbs each.)



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B26. Wheel, Abrasive, Fine Grit. Shall be an aluminum oxide straight grinding wheel, fine grit, 7" diameter x 1" thick, with a 0.625" arbor hole (or appropriate adapter). (For use with item B13) **(NOTE: This item for Production Representative System only.)**



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B27. Wheel, Abrasive, Coarse Grit. Shall be an aluminum oxide straight grinding wheel, coarse grit, 7" diameter x 1" thick, with a 0.625" arbor hole (or appropriate adapter). (For use with item B13) **(NOTE: This item for Production Representative System only.)**



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B28. Wrench Set, Combination, Inch. Shall be a set of combination open end and box end wrenches as follows:



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#	Description
1	$\frac{1}{4}$ "
2	$\frac{5}{16}$ "
3	$\frac{3}{8}$ "
4	$\frac{7}{16}$ "
5	$\frac{1}{2}$ "
6	$\frac{9}{16}$ "
7	$\frac{5}{8}$ "
8	$\frac{11}{16}$ "
9	$\frac{3}{4}$ "
10	$\frac{13}{16}$ "
11	$\frac{7}{8}$ "
12	$\frac{15}{16}$ "
13	1"
14	$1-\frac{1}{16}$ "
15	$1-\frac{1}{8}$ "
16	$1-\frac{1}{4}$ "
17	$1-\frac{5}{16}$ "
18	$1-\frac{3}{8}$ "
19	$1-\frac{7}{16}$ "
20	$1-\frac{1}{2}$ "
21	$1-\frac{5}{8}$ "
22	$1-\frac{11}{16}$ "
23	$1-\frac{3}{4}$ "
24	$1-\frac{13}{16}$ "
25	$1-\frac{7}{8}$ "

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26	2"
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B29. Wrench Set, Combination, Metric. Shall be a set of combination open end and box end wrenches as follows:



#	Description
1	7mm
2	8mm
3	9mm
4	10mm
5	11mm
6	12mm
7	13mm
8	14mm
9	15mm
10	16mm
11	17mm
12	18mm
13	19mm
14	20mm
15	21mm
16	22mm
17	23mm
18	24mm
19	25mm
20	26mm
21	27mm
22	28mm
23	29mm

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24	30mm
25	32mm
26	36mm

**B30. Wrench Set, Master, Impact Wrench, 3/8" & 1/2"**

**Drive.** Shall be a set of one 1/2" square drive electric impact wrench and one 1/2" square drive pneumatic impact wrench with sockets and accessories. The pneumatic impact wrench shall be reversible; and shall have 1/4" NPT inlet, a handle exhaust, and a maximum rated output of 400 ft-lbs in the forward direction and 600 ft-lb in reverse. A male 3/8" ID quick disconnect fitting shall be installed on each pneumatic impact wrench. The electric impact wrench shall be reversible, shall operate on 120 Volt, 60 Hz, single-phase current, and shall have a rated output of 300 ft/lbs of torque in both directions. The sockets and accessories to be included are as follows:



#	Description
	<b>Impact Sockets, 3/8" Drive, 6-Point, Regular</b>
1	1/4"
2	5/16"
3	3/8"
4	7/16"
5	1/2"
6	9/16"
7	5/8"
8	11/16"
9	3/4"
10	10 mm
11	11 mm
12	12 mm
13	13 mm
14	14 mm
15	15 mm



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16	16 mm
17	17 mm
18	18 mm
19	19 mm
	<b>Impact Sockets, 3/8" Drive, 6-Point, Long</b>
20	1/4"
21	5/16"
22	3/8"
23	7/16"
24	1/2"
25	9/16"
26	5/8"
27	11/16"
28	3/4"
29	10 mm
30	11 mm
31	12 mm
32	13 mm
33	14 mm
34	15 mm
35	16 mm
36	17 mm
37	18 mm
38	19 mm
	<b>Accessories, 3/8" Square Drive</b>
39	Extension Bar, length 2.5" – 3.5"
40	Extension Bar, length 5.5" – 6.5"
41	Universal Joint, length 2.5" maximum
	<b>Impact Sockets, 1/2" Drive, 6-Point, Regular</b>

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42	3/8"
43	7/16"
44	1/2"
45	9/16"
46	5/8"
47	11/16"
48	3/4"
49	13/16"
50	7/8"
51	15/16"
52	1"
53	1-1/16"
54	12 mm
55	13 mm
56	14 mm
57	15 mm
58	16 mm
59	17 mm
60	18 mm
61	19 mm
62	21 mm
63	22 mm
64	24 mm
65	27 mm
	<b>Impact Sockets, 1/2" Drive, 6-Point, Long</b>
66	3/8"
67	7/16"
68	1/2"
69	9/16"
70	5/8"

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71	11/16"
72	3/4"
73	13/16"
74	7/8"
75	15/16"
76	1"
77	1-1/16"
78	12 mm
78	13 mm
80	14 mm
81	15 mm
82	16 mm
83	17 mm
84	18 mm
85	19 mm
86	21 mm
87	22 mm
88	24 mm
89	27 mm
	<b>Accessories, 1/2" Square Drive</b>
90	Extension Bar, length 2.5" – 3.5"
91	Extension Bar, length 5.5" – 6.5"
92	Extension Bar, length 9.5" – 10.5"
93	Universal Joint, length 3.063" maximum
94	3/8" Male to 1/2" Female Square Drive Adapter
	<b>Other 1/2" Square Drive Tools</b>
95	3/4" x 13/16" Double-end Socket

B31. Wrench, Adjustable, 10". Shall be a standard opening adjustable wrench with a 10" nominal length, a 1-1/8" jaw capacity, a black oxide finish. (Reference ASME B107.8, Type I, Class 2)



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B32. Wrench, Adjustable, 18". Shall be a standard opening adjustable wrench with an 18" nominal length, a 0 - 2-1/16" jaw capacity, a black oxide finish. (Reference ASME B107.8, Type I, Class 2)

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B33. Wrench Kit, Ratchet, Pneumatic, 3/8" Drive. Shall produce at least 45 ft-lb max torque, and shall be provided with a 1/2" square drive attachment, a 1/4" hex bit attachment, 2 slotted screwdriver hex bits, 2 cross-tip screwdriver hex bits, and a carrying case. A male 3/8" ID quick disconnect fitting shall be installed on each ratchet wrench. (Photo not available)

B34. Wrench, Torque, Click, Ratcheting, 3/4" Drive, 600 Ft-Lb. Shall be a ratcheting click style torque-setting wrench with a micrometer dial. The torque wrench shall indicate via audible, tactile, and visual signal that the applied torque in either the clockwise or counterclockwise direction has reached the preset torque value. The wrench torque range shall be 100-600 foot-pounds. The wrench shall have a reversible ratcheting head, a 3/4" square male drive, and a micrometer scale marked in 10 foot-pound increments. It shall conform to ANSI B107.14, Type 2, Class A, Style 2, and Design A.



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B35. Wrench, Torque, Dial, 3/8" Drive, 300 In-Lb. Shall be a rigid housing style torque-indicating wrench with a plain dial. The dial indicator shall show torque when applied in both the clockwise and counterclockwise directions using a pointer and indicator plate. The wrench torque capacity shall be from 0 to 300 inch-pounds. The wrench shall have a 3/8" square male drive, a non-ratcheting head, and a scale marked in increments of 5 inch-pounds. It shall conform to ANSI B107.14, Type 1, Class B, and Style 1.



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B36. Wrench, Torque, Dial, 1/4" Drive, 30 In-Lb. Shall be a rigid housing style torque-indicating wrench with a plain dial. The dial indicator shall show torque when applied in both the clockwise and counterclockwise directions using a pointer and indicator plate, and memory follower indicator to display maximum applied torque. The wrench torque capacity shall be from 0 to 30 inch-



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pounds. The wrench shall have a 1/4" square male drive, a non-ratcheting head, and a scale marked in increments of 1 inch-pounds. It shall conform to ANSI B107.14, Type 1, Class B, and Style 3.

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APPENDIX C  
COMPONENT LIST  
SATS SUPPLEMENTAL TOOL KIT #2

For the systems that will be used as Production Representative Systems for testing purposes, all components listed in the following table will be provided and space within the container allocated for each component.

For all future delivery orders components listed with Remarks Code 16 or Remarks Code 22, space will be allocated within the container for each item and that location documented, however, the item itself will not be provided.

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#	NOMENCLATURE	UI	QTY	WTY*	RC**
	<b>MODULE 2</b>				
1	ADAPTER KIT, GREASE GUN COUPLING	EA	1	C	
2	BLADE, ABRASIVE, CUT-OFF	PG	1	N	21
3	BLADE, HAND HACKSAW	BD	1	N	21
4	BOX, TOTE	EA	5	N	10
5	CABLE KIT, SPECIAL POWER	EA	1	N	10
6	CROWBAR	EA	1	L	10
7	DRILL SET, TWIST	SE	2	N	
8	DRILL SET, TWIST, LEFT HAND	SE	1	N	10
9	DRILL-DRIVER, BATTERY OPERATED, RECHARGEABLE	EA	1	C	
10	DRILL, ELECTRIC, PORTABLE, 3/8"	EA	1	C	
11	DRILL, ELECTRIC, PORTABLE, 1/2"	EA	1	C	
12	DRILL-DRIVER, ELECTRIC, 1/2"	EA	1	C	
13	DRILL, PNEUMATIC, RIGHT ANGLE	EA	1	C	
14	EXTRACTOR SET, HARDENED SCREW	SE	1	N	
15	EXTRACTOR SET, SCREW	SE	1	C	
16	HAMMER, HAND, CARPENTERS, CURVED CLAW, 16 OZ	EA	1	C	
17	HAMMER, HAND, SOFT FACE, DEAD BLOW, 52 OZ	EA	1	C	
18	HAMMER, HAND, SOFT FACE, DEAD BLOW, 10 OZ	EA	1	C	
19	HAMMER, SLEDGE, DOUBLE FACED, 10 LB	EA	1	C	
20	HAMMER, HAND, DEAD BLOW, BALL PEEN, 40 OZ	EA	1	C	
21	HAMMER SET, HOLDER AND INSERTS	SE	1	C	
22	JACK, BOTTLE, HYDRAULIC, HAND, 30 TON	EA	1	C	
23	JACK, BOTTLE, HYDRAULIC, HAND, 12 TON	EA	2	C	10
24	LIFT, TRANSMISSION AND DIFFERENTIAL	EA	1	C	
25	LIGHT, BATTERY OPERATED, RECHARGEABLE	EA	1	C	
26	MEASURE, LIQUID, 2 QUART	EA	1	C	10
27	MEASURE, LIQUID, 8 QUART	EA	1	C	10
28	OILER, HAND	EA	2	C	10
29	PLATE, BOLSTER, 24" x 24"	EA	2	N	10
30	PLATE, BOLSTER, 36" x 36"	EA	1	N	10
31	PLATE, BOLSTER, 40" x 72"	EA	1	N	10
32	PLIERS, LOCK RING	EA	1	L	
33	PLIERS, LOCK RING	EA	1	L	
34	PULLER SET, MECHANICAL	SE	1	L	
35	SANDER/GRINDER, 4 1/2"	EA	1	C	
36	SOCKET SET, SOCKET WRENCH, 3/4" DRIVE, INCH, REGULAR	SE	1	L	
37	TOOL KIT, CUTTING, ABRASIVE, PNEUMATIC	KT	1	C	
38	WHEEL, ABRASIVE, TYPE 27 (NOTE: THIS ITEM FOR	PK	1	N	22

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	<b>PRODUCTION REPRESENTATIVE SYSTEM ONLY</b>				
39	WHEEL, ABRASIVE, TYPE 29 <b>(NOTE: THIS ITEM FOR PRODUCTION REPRESENTATIVE SYSTEM ONLY)</b>	PK	1	N	22
40	WRENCH SET, MASTER, IMPACT WRENCH, 3/8" AND 1/2" DRIVE	SE	1	C	10

\* Warranty Column definitions:

L = Lifetime Warranty

C = Commercial Warranty Available

N = No Warranty

\*\* RC (Remarks Code): For Government use only

**SPECIAL NOTATION:** Components marked with RC 16 or 22 will be provided by the contractor for Production Representative System only for purposes of space allocations, weights and testing. These components will not be included in all other future production sets.

16 = This item is not initially issued as a component of the SKO. The item may be requisitioned "as required" when authorized by the Commanding Officer.

22 = This is a consumable item, non-accountable on hand receipt, not issued with the tool set, quantity established by gaining unit.



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C1. Adapter Kit, Grease Gun Coupling. Shall fit manual or air-operated grease guns. Shall attach to any standard grease coupler for immediate service.

	Components
1	18" Steel Braid Rubber Grease Hose W/ Spring Guard & 4-Jaw Coupler
2	Hypodermic Needle Coupler For Lubricating Sealed Bearings
3	Straight Needlepoint Coupler
4	90 Degree 3" Needlepoint Coupler
5	9" Rigid Extension W/ 4-Jaw Coupler
6	Needlepoint Coupler, Right Angle
7	Right Angle Coupler
8	Standard Button-Head Coupler
9	1/4"-28 Zerk Extractor
10	1/8" NPT Zerk Extractor
11	Carrying case



C2. Blade, Abrasive, Cut-Off. The abrasive blade shall have an overall diameter of 3", a width of 1/16", and a 3/8" diameter arbor hole. (For use with item C37)



C3. Blade, Hand Hacksaw. The blades shall be bimetal, 12" long, .025" thickness, 24 teeth per inch and shall have 10 blades per bundle.



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C4. Box, Tote. The tote box shall approximately be 18.25" long, 5.5" high, and 11" wide. The box configuration shall permit it to be nested and stacked with like boxes.



C5. Cable Kit, Special Power. The kit shall contain one cable assembly, P/N 11682336-1 and two adapters, with P/N 11677570. It is a slave-start (jumper) cable for military vehicles with connectors conforming to a NATO standard. (The coiled cable depicted forms a disk roughly 14" in diameter and 6" thick. Approximate weight is 32 lbs.)



C6. Crowbar. Shall be 59-62" long and approximately 1 1/4" wide. Shall have a round handle tapering slightly toward handle end. Shall have a pinch-point style work end with square sides and a flat, single-beveled edge. The work end shall be equal in width to the distance across the flat surfaces of the bar.



C7. Drill Set, Twist. Shall contain 1 each, from 1/16 to 1/2", in 1/64 increments (29 bits). Drill bits shall be cobalt steel alloy with 135 degree split point and straight round shank. Drill bits shall be intended for use on stainless steels, heat-treated, steels, forgings, chilled cast iron, and other applications involving extreme hardness or abrasive materials. Shall have a drill bit index for storage.



C8. Drill Set, Twist, Left Hand. Shall contain 1 each, 5/64", 7/64", 1/8", 5/32", 3/16", 7/32", 1/4", 9/32", 19/64", 5/16", 11/32", 3/8", 13/32", 7/16", 15/32", and 1/2" (16 bits). Drill bits shall be cobalt steel alloy with 135 degree split point and straight round shank. Drill bits shall be

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intended for use on stainless steels, heat-treated, steels, forgings, chilled cast iron, and other applications involving extreme hardness or abrasive materials. Shall have a drill bit index for storage. (Picture not available.)

C9. Drill-Driver, Battery Operated, Rechargeable. Shall be an 18 volt, 2 Amp-Hour battery-operated, 1/2" drill with the following features: trigger-controlled variable speed; dual speed range (No-Load RPM Low: 0 to at least 400 rpm, High: 0 to at least 1000 rpm); trigger lock; forward and reverse operation; and a keyless chuck. For drilling operations, the drill shall produce at least 400 in-lbs torque at low speed and at least 120 in-lbs at high speed. For driving operations, the drill shall be furnished with a multi-position chuck permitting incremental limitation of the output torque over the range of 0 to at least 80 in-lbs. Battery charger shall be supplied. Kit shall come with a storage case.



C10. Drill, Electric, Portable, 3/8". Shall have a 3/8" keyed jaw chuck, pistol grip handle and a variable speed 120 Volt 60 Hz motor for operation from 0 – 1300 RPM. Shall be rated for drilling holes in steel up to 3/8" in diameter. Shall be double insulated and designed for close quarters work. Drill head shall be not more than 4" from front to back, and not more than 2.5" in diameter.



C11. Drill, Electric, Portable, 1/2". Shall have a 1/2" keyed jaw chuck, pistol grip handle and a variable speed 120 Volt 60 Hz motor for operation from 0 – 750 RPM. Shall be rated for drilling holes in steel up to 1/2" in diameter. Shall be double insulated and designed for close quarters work. Drill head shall be not more than 4.5" from front to back, and not more than 2.5" in diameter.



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C12. Drill, Driver, Electric, 1/2". Shall be a "D" handle drill with a 1/2" keyed jaw chuck. Shall be reversible and have a 120 Volt 60 Hz, single-phase variable speed motor for speeds from 0 to at least 500 RPM. Shall be rated for drilling 1/2" holes in steel. Side handle shall be included.



C13. Drill, Pneumatic, Right Angle. Shall have a 3/8" keyed jaw chuck. Shall have a rear exhaust. The drill shall have forward and reverse. Shall be lever actuated with a 1/2 hp motor and a free speed of 1200 RPM. A male 3/8" ID quick disconnect fitting shall be installed on each drill.



C14. Extractor Set, Hardened Screw. The extractor screw set, shall drill point center on rough jagged breaks with grades that vary from 2 to 8. Shall allow for easy access to confined areas.



C15. Extractor Set, Screw. Shall be a set of left hand drill bits and corresponding screw extractors. It shall contain 7 left-hand drill bits ranging from 1/8" to 1/2" by 16ths, and 6 sizes of screw extractor.



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C16. Hammer, Hand, Carpenters', Curved Claw, 16 Oz. Shall be a curved claw carpenters' nailing hammer with a fiberglass handle and a cushion grip. It shall have a 16 oz non-magnetized head.



C17. Hammer, Hand, Soft Face, Dead Blow, 52 Oz. The hammer shall have a face diameter of 2.75", a head weight of 52 oz, a nonmetallic head, a steel reinforced handle, and an overall length of 16".



C18. Hammer, Hand, Soft Face, Dead Blow, 10 Oz. The hammer shall have a face diameter of 1.25", a head weight of 10 oz, a nonmetallic head, a steel reinforced handle, and an overall length of 10".



C19. Hammer, Sledge, Double Faced, 10 Lb. The hammer shall have a head weight of 10 lbs and a face diameter of 2.5 inches. The fiberglass handle shall have a cushioned grip and a length of 32 inches.



C20. Hammer, Hand, Dead Blow, Ball Peen, 40 Oz. The hammer shall have a hardened steel face and peen, a head weight of 40 oz, a face diameter of 1-11/16", a steel reinforced handle, and an overall length of at least 15".



C21. Hammer Set, Holder and Inserts. Shall consist of two soft face hammers, with tips. The head diameters shall be 1.5" and 2", respectively. The 1.5" hammer shall have one medium and one hard non-metallic tip. The 2" hammer shall have one tough and one extra hard non-metallic tip. For easy replacement, the surface protective tips shall be attached to the hammerheads by threaded studs.





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C22. Jack, Bottle, Hydraulic, Hand, 30 Ton. The jack shall be a self-contained unit consisting of a solid plunger and an integral pump, ram and reservoir. The jack shall have a rated load capacity of at least 30 tons. It shall have a minimum extended height 16” and maximum retracted height of 11”, and shall be supplied with a removable pump handle.



C23. Jack, Bottle, Hydraulic, Hand, 12 Ton. The jack shall be a self-contained unit consisting of a solid plunger and an integral pump, ram and reservoir. The jack shall have a rated load capacity of at least 12 tons. It shall have a minimum extended height 16.5” and maximum retracted height of 9.125”, and shall be supplied with a removable pump handle.



C24. Lift, Transmission and Differential. Shall be a hydraulic lift for installing and removing transmissions and differentials. Shall have a rated capacity of at least 2000 pounds. Shall have a height of 10” maximum when fully lowered and a lift height of at least 36”. Saddle shall tilt and lock at least 10 degrees from the horizontal in all directions. The lift shall be provided with four swivel casters and handgrips to permit accurate positioning of the load during installation. The lift shall be provided with a variety of chains, wedges, clamps, bars, brackets, and other attachments for the saddle to permit a wide variety of transmissions and differentials to be secured and stabilized on the lift. (The transmission lift depicted has overall envelope dimensions of 28” wide, 43” long, and 12” high with the lift arm fully lowered. It comes with a box of accessories that is 32” long by 8” wide by 6.5” tall. Approximate weight of the transmission lift is 200 lbs, and the box of accessories weighs 101 lbs.)



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C25. Light, Battery Operated, Rechargeable. Shall be an 18-volt, 2 Amp-Hour battery-powered work light. Work light shall have the following features: an on-off switch; a wide-angle fixed beam, a stable base for stranding upright on flat surfaces; and a multi-position swivel head which permits the beam direction to be incrementally adjusted from parallel with the handle through an arc of 120 degrees. Battery and battery charger shall be supplied. Kit shall come with a storage case.



C26. Measure, Liquid, 2 Quart. Shall be a leak-proof can of the type used for measuring and dispensing oil. The can shall include a finger operated flow-control release valve and loop handle on the side opposite the spout. The bottom shall be designed to allow the can to drain completely while being held level. It shall have a flexible 14" spout with a 60-degree vertical swivel and a pouring tip that dispenses oil from the bottom of the can. The spout shall fasten in the up-right position when not in use.



C27. Measure, Liquid, 8 Quart. Shall be a leak-proof can of the type used for measuring and dispensing oil. The can shall include a finger operated flow-control release valve and loop handle on the side opposite the spout. The bottom shall be designed to allow the can to drain completely while being held level. It shall have a flexible 14" spout with a 60-degree vertical swivel and a pouring tip that dispenses oil from the bottom of the can. The spout shall fasten in the up-right position when not in use.



C28. Oiler, Hand. The hand-pumped oiler shall have a ¼ pint (4 oz.) capacity. Shall have a nozzle adjustable for delivery from a fine mist to a thin stream. The spout shall have a length of at least three inches.



C29. Plate, Bolster, 24" x 24". Shall be suitable for use as cribbing under a 12-ton bottle jack when used on unpaved surfaces. The bolster plates shall be fabricated of material with sufficient durability, strength, rigidity, and resilience to withstand their rated loads without fracturing,

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splintering, or permanently deforming when the loads are imposed on a frequent and long-term basis at any and all temperatures from  $-25^{\circ}\text{F}$  to  $+125^{\circ}\text{F}$ . The material shall neither absorb nor be subject to damage from water, petroleum products, and detergents; and shall neither be damaged by nor support the growth of fungus and mildew. The material shall not corrode, and shall be resistant to damage from ozone and ultraviolet light. The bolster plates shall have a surface area and thickness sufficient to distribute their rated loads to an average value of 50 pounds or less per square inch (approximately  $2' \times 2'$ ). The bolster plates shall be provided with handhold opening(s) at least  $6'' \times 3''$  to provide a secure grasp while wearing winter gloves as well as with the unprotected hand.

C30. Plate, Bolster,  $36'' \times 36''$ . Shall be suitable for use as cribbing under a 30-ton bottle jack when used on unpaved surfaces. The bolster plates shall be fabricated of material with sufficient durability, strength, rigidity, and resilience to withstand their rated loads without fracturing, splintering, or permanently deforming when the loads are imposed on a frequent and long-term basis at any and all temperatures from  $-25^{\circ}\text{F}$  to  $+125^{\circ}\text{F}$ . The material shall neither absorb nor be subject to damage from water, petroleum products, and detergents; and shall neither be damaged by nor support the growth of fungus and mildew. The material shall not corrode, and shall be resistant to damage from ozone and ultraviolet light. The bolster plates shall have a surface area and thickness sufficient to distribute their rated loads to an average value of 50 pounds or less per square inch (approximately  $3' \times 3'$ ). The bolster plates shall be provided with handhold opening(s) at least  $6'' \times 3''$  to provide a secure grasp while wearing winter gloves as well as with the unprotected hand.

C31. Plate, Bolster,  $40'' \times 72''$ . Shall be at least 3 feet 4 inches by 6 feet, and suitable for use as cribbing under a 2000 lb capacity transmission lift when used on unpaved surfaces. The bolster plates shall be fabricated of material with sufficient durability, strength, rigidity, and resilience to withstand their rated loads without fracturing, splintering, or permanently deforming when the loads are imposed on a frequent and long-term basis at any and all temperatures from  $-25^{\circ}\text{F}$  to  $+125^{\circ}\text{F}$ . The material shall neither absorb nor be subject to damage from water, petroleum products, and detergents; and shall neither be damaged by nor support the growth of fungus and mildew. The material shall not corrode, and shall be resistant to damage from ozone and ultraviolet light. The bolster plates shall have a surface area and thickness sufficient to distribute their rated loads to an average value of 50 pounds or less per square inch. The bolster plates shall be provided with handhold opening(s) at least  $6'' \times 3''$  to provide a secure grasp while wearing winter gloves as well as with the unprotected hand.

C32. Pliers, Lock-Ring. Shall have a straight tip design conforming to ASME B107.19, Type III, Class 1, for spreading snap-lock rings.



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C33. Pliers, Lock-Ring. Shall conform to ASME B107.19, Type III, Class 2, for spreading snap-lock rings found on brakes, transmissions, pedal shifts, clutch shifts, and machine tools. Shall also be suitable for use on piston rings. Shall be able to hold rings securely in any position.



C34. Puller Set, Mechanical. Shall consist of pullers and puller accessories. Shall be rated for a pulling force of at least 10 tons. The puller set shall consist of:



<b>2-Arm Pullers</b>
4" Spread, 3-1/4" Reach
6" Spread, 3-1/4" Reach
9" Spread, 5" Reach
12" Spread, 11" Reach
<b>Bearing Separators</b>
1/4" to 15/16" Capacity
1/8" to 2" Capacity
1/2" to 4-5/8" Capacity
<b>Press-Puller</b>
Frame and forcing screw with 2-1/8" to 7-1/4" Spread
Two Leg Ends
Two 6-3/4" Legs
Two 15-3/4" Legs
Two Leg Connectors
<b>Gear and Pulley Puller</b>
1-1/2" – 4-1/4" Spread, 13" forcing screw
<b>Internal Puller</b>
1-1/2" to 6" Spread, 4" Reach

<b>Steering Wheel Puller</b>
Body with forcing screw
Two Cap Screws 3/8"-16 x 3-1/2"
Two Cap Screws 5/16"-18 x 3-1/2"
Two Cap Screws 5/16"-24 x 3-1/2"
Two Cap Screws 5/16"-24 x 4" (SIR)
Two Cap Screws M8"-1.25 x 90mm
<b>Pittman Arm Puller</b>
2-3/4" Spread, 5-1/2" Reach
<b>Harmonic Balancer Puller</b>
Frame and forcing screw for bolt circle diameters from 1-1/2" to 4-5/8"
Three cap screws 3/8"-24 x 3"
Three cap screws 3/8"-16 x 3"
<b>Side Hammer</b>
2 Leg/3 Leg head with Inside/Outside Legs, 1-1/4" to 4-1/2" Spread, 2-1/2 lb. Hammer
<b>Pilot Bearing Puller</b>
2 Leg Inside Head, 1-1/2" Spread and 3/4" Reach, 1-3/4 Lb. Hammer
<b>Threaded Shaft Adapters</b>
5/8"-18 x 5/8"-18
5/8"-18 x 3/4"-16
5/8"-18 x 7/8"-14
5/8"-18 x 1"-14
5/8"-18 x 1-1/8"-12
5/8"-18 x 1-1/4"-12
<b>Hollow Shaft Adapters</b>
1" x 3/4"
1-1/8" x 7/8"
1-1/4" x 1"
1-3/8" x 1-1/8"
1-5/8" x 1-1/4"

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1-3/4" x 1-3/8"
1-7/8" x 1-1/2"
2" x 1-5/8"
2-1/8" x 1-3/4"
2-3/8" x 1-7/8"
2-1/2" x 2"

C35. Sander/Grinder 4.5". The right-angle style grinder shall have a 120 Volt, 60 Hz, single phase, 2.1 hp variable speed motor, with a rated speed top speed of at least 10000 rpm, long life brushes and high output fan. The spindle thread size shall be 5/8"-11. The grinder shall have a lock off button and shall be double insulated.



C36. Socket Set, Socket Wrench, 3/4" Drive, Inch, Regular. Shall consist of the items listed below.



#	Description
1	Ratchet handle, length 17" min
2	Sliding T-handle, length 17" min – 20" max
3	Extension, length 4.5" min – 5.5" max
4	Extension, length 7.5" min – 8.5" max
5	Extension, length 15" min – 17" max
6	Universal Joint
7	Adapter, 3/4" drive to 1/2" drive
8	Socket, 7/8"
9	Socket, 15/16"
10	Socket, 1"
11	Socket, 1-1/16"

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12	Socket, 1-1/8"
13	Socket, 1-1/4"
14	Socket, 1-5/16"
15	Socket, 1-3/8"
16	Socket, 1-7/16"
17	Socket, 1-1/2"
18	Socket, 1-9/16"
19	Socket, 1-5/8"
20	Socket, 1-11/16"
21	Socket, 1-3/4"
22	Socket, 1-13/16"
23	Socket, 1-7/8"
24	Socket, 2"
25	Socket, 2-1/16"
26	Socket, 2-1/8"
27	Socket, 2-3/16"
28	Socket, 2-1/4"
29	Socket, 2-3/8"

C37. Tool Kit, Cutting, Abrasive, Pneumatic. Pneumatic cut-off tool shall have a 3/8" arbor. The lever-actuated pneumatic tool shall have a rear exhaust, a 1/4" NPT air inlet, and a rated speed of 18,000 RPM. The kit shall include a 360-degree swivel adapter for the air inlet, a carrying case, and a supply of 10 abrasive blades. A male 3/8" ID quick disconnect fitting shall be installed on each cut-off tool.



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C38. Wheel, Abrasive, Type 27. Shall be a zirconium aluminum Type 27 depressed center grinding disc for use with a right-angle sander/grinder. Shall have a 4-1/2" diameter and a 5/8" arbor hole. (For use with item C35) **(NOTE: This item is for Production Representative System only.)**



C39. Wheel, Abrasive, Type 29. Shall be zirconium aluminum disc Type 29 depressed center abrasive flap disk for use with a right-angle sander/grinder. It shall have a 4" diameter and a 5/8" arbor hole. The abrasive shall be 36 grit. (For use with item C35) **(NOTE: This item is for Production Representative System only.)**



C40. Wrench Set, Master, Impact Socket, 3/8" & 1/2" Drive. Shall be a set of one 1/2" square-drive electric impact wrench and one 1/2" square-drive pneumatic impact wrench with sockets and accessories. The pneumatic impact wrench shall be reversible; and shall have 1/4" NPT inlet, a handle exhaust, and a maximum rated output of 400 ft-lbs in the forward direction and 600 ft-lb in reverse. A male 3/8" ID quick disconnect fitting shall be installed on each pneumatic impact wrench. The electric impact wrench shall be reversible, shall operate on 120 Volt, 60 Hz, single-phase current, and shall have a rated output of 300 ft/lbs of torque in both directions. The sockets and accessories to be included are as follows:



#	Description
	<b>Impact Sockets, 3/8" Drive, 6-Point, Regular</b>
1	1/4"
2	5/16"
3	3/8"
4	7/16"
5	1/2"

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6	9/16"
7	5/8"
8	11/16"
9	3/4"
10	10 mm
11	11 mm
12	12 mm
13	13 mm
14	14 mm
15	15 mm
16	16 mm
17	17 mm
18	18 mm
19	19 mm
	<b>Impact Sockets, 3/8" Drive, 6-Point, Long</b>
20	1/4"
21	5/16"
22	3/8"
23	7/16"
24	1/2"
25	9/16"
26	5/8"
27	11/16"
28	3/4"
29	10 mm
30	11 mm
31	12 mm
32	13 mm
33	14 mm
34	15 mm

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35	16 mm
36	17 mm
37	18 mm
38	19 mm
	<b>Accessories, 3/8" Square Drive</b>
39	Extension Bar, length 2.5" – 3.5"
40	Extension Bar, length 5.5" – 6.5"
41	Universal Joint, length 2.5" maximum
	<b>Impact Sockets, 1/2" Drive, 6-Point, Regular</b>
42	3/8"
43	7/16"
44	1/2"
45	9/16"
46	5/8"
47	11/16"
48	3/4"
49	13/16"
50	7/8"
51	15/16"
52	1"
53	1-1/16"
54	12 mm
55	13 mm
56	14 mm
57	15 mm
58	16 mm
59	17 mm
60	18 mm
61	19 mm
62	21 mm

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63	22 mm
64	24 mm
65	27 mm
	<b>Impact Sockets, 1/2" Drive, 6-Point, Long</b>
66	3/8"
67	7/16"
68	1/2"
69	9/16"
70	5/8"
71	11/16"
72	3/4"
73	13/16"
74	7/8"
75	15/16"
76	1"
77	1-1/16"
78	12 mm
78	13 mm
80	14 mm
81	15 mm
82	16 mm
83	17 mm
84	18 mm
85	19 mm
86	21 mm
87	22 mm
88	24 mm
89	27 mm
	<b>Accessories, 1/2" Square Drive</b>
90	Extension Bar, length 2.5" – 3.5"



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91	Extension Bar, length 5.5" – 6.5"
92	Extension Bar, length 9.5" – 10.5"
93	Universal Joint, length 3.063" maximum
94	3/8" Male to 1/2" Female Square Drive Adapter
	<b>Other 1/2" Square Drive Tools</b>
95	3/4" x 13/16" Double-end Socket

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## **APPENDIX D**

### **HUMAN ENGINEERING DESIGN GUIDELINES FOR VEHICLE-MOUNTED SETS, KITS, AND OUTFITS**

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**D1. SCOPE**

D1.1. Scope. This appendix establishes specific human engineering design guidelines for the SATS. The requirements in this appendix represent a tailored version of MIL-STD-1472, which is the Army's general design standard for Human Engineering.

D1.2. Purpose. The purpose of this appendix is to present human engineering design criteria, principles, and practices to achieve mission success through integration of the human into the SATS and achieve effectiveness, simplicity, efficiency, reliability, and safety of operation and maintenance.

D1.3. Application. This appendix may be applied to the design of the SATS. It is not intended for application to off-the-shelf items selected for incorporation into the SATS, except as specifically noted herein. Nothing in this appendix should be construed as limiting the selection of hardware, materials, or processes to the specific items described herein.

D2. General. This appendix does not alter requirements for participation of human engineering specialists in development of the SATS to interpret and implement these practices and to provide solutions to human engineering problems which arise and which are not specifically covered herein.

D2.1. Manufacturing tolerances. When manufacturing tolerances are not perceptible to the user, this appendix should not be construed as preventing the use of components whose dimensions are within a normal manufacturing upper or lower limit tolerance of the dimensions specified herein.

**D3. APPLICABLE DOCUMENTS**

The documents cited in this section are for reference only, and do not constitute a part of this standard. They are provided as a source of additional information.

**HANDBOOKS**

**DEPARTMENT OF DEFENSE**

	DOD-HDBK-743	-	Anthropometry of US Military Personnel
	MIL-HDBK-759	-	Human Factors Engineering Design for Army
Materiel	MIL-HDBK-1908	-	Definitions of Human Factors Terms

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order desk, 700 Robbins Avenue, Bldg 4D, Philadelphia, PA 19111-5094.)

**D4. DEFINITIONS**

Unless otherwise specified, terms are defined in accordance with MIL-HDBK-1908.

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**D5. GENERAL REQUIREMENTS**

D5.1. Objectives. The SATS should provide work a environment which fosters effective procedures, work patterns, and personnel safety and health, and minimizes factors which degrade human performance or increase error. Design should also minimize personnel and training requirements within the limits of time, cost, and performance trade-offs.

D5.2. Standardization. Criterion for selecting off-the-shelf commercial equipment should include the degree to which the equipment conforms to this standard. Where off-the-shelf equipment requires modification in order to interface with other equipment, the modification should be designed to comply with the criteria herein. Redesign or modification of off-the-shelf commercial equipment for the sole purpose of complying with the requirements of this Appendix must have the approval of the procuring activity.

D5.3. Function allocation. Design should reflect allocation of functions to personnel, equipment, and personnel-equipment combinations to achieve: a. required time and safety, b. minimum number and level of skills of personnel required to operate and maintain the SATS, and c. required performance in a cost-effective manner.

D5.4. Human engineering design. Design should reflect human engineering and biomedical factors that affect human performance, including, when applicable: a. protection from thermal, toxicological, mechanical, electrical, electromagnetic, visual, and other hazards; b. adequate space for personnel, their equipment, and free volume for the movements and activities they are required to perform during operation and maintenance tasks under both normal and emergency conditions; c. adequate physical, visual, auditory, and other communication links between personnel and their equipment under both normal and emergency conditions; d. efficient arrangement of operation and maintenance workplaces, equipment, controls, and displays; e. design features to assure rapidity, safety, ease and economy of operation and maintenance; f. compatibility of the design, location and layout of controls, workspaces, maintenance accesses, stowage provisions, allocated tasks, and control movements with the clothing and personal equipment to be worn by personnel operating and maintaining the SATS.

D5.4.1. Safety. Design should reflect applicable system and personnel safety factors, including minimizing potential human error in the operation and maintenance of the SATS.

D5.4.2. Layout. Units should be laid out so that a minimum of place-to-place movements will be required during operation.

D5.4.3. NBC survivability. The SATS should permit performance of mission-essential operations, maintenance, and decontamination tasks by suitably clothed, trained, and acclimatized personnel for the NBC environments required by the system.

D5.4.4. Simplicity of design. The equipment should represent the simplest design consistent with functional requirements and expected service conditions. It should be capable of being operated, maintained, and repaired in its operational environment by personnel with a minimum of training.

**D6. DETAILED REQUIREMENTS**

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**D6.1. Anthropometry.**

**D6.1.1. General.** Design and sizing should ensure operability and maintainability by the user population. Generally, design limits should be based upon a range from the 5<sup>th</sup> percentile female to the 95<sup>th</sup> percentile male values for critical body dimensions, as appropriate. This design range from the 5<sup>th</sup> to 95<sup>th</sup> percentile values will theoretically provide coverage for 90 percent of the user population for that dimension. **NOTE:** The data provided herein are intended for use as individual (stand-alone) parameters, which should be adequate to support design of the SATS. However, the relationships or correlations between body measurements are highly variable. If two or more dimensions are used simultaneously as design parameters, they cannot be assumed to be additive; appropriate multivariate data and techniques must be utilized. Simultaneous use of two or more anthropometric dimensions as a design parameter should require approval of the procuring activity.

**D6.1.2. Anthropometric data.** Anthropometric data for the design and sizing of workspaces involving the standing position are presented in Table 1 and illustrated in Figure 1. Fifth and 95<sup>th</sup> percentile values are given for various body dimensions. Suitable allowances should be made for heavy clothing or protective equipment when required. Clearance dimensions should be not less than the 95<sup>th</sup> percentile values for men; limiting dimensions should be not more than the 5<sup>th</sup> percentile values for women, shown in Table I. The intended user population for the SATS consists of Military Occupational Specialty (MOS) for maintenance. Maintenance Workers are required to possess greater physical strength than the general population, and the criteria herein have been adjusted accordingly.

**D6.1.3. Use of Data.** Use of these data should consider (a) the nature, frequency, safety, and difficulty of the related tasks to be performed by the operator of the equipment; (b) the position of the body during performance of these tasks; (c) mobility or flexibility requirements imposed by these tasks; and (d) increments in the design-critical dimensions imposed by the need to compensate for obstacles and projections.

**D6.1.4. Adjustments.** Because the above-cited anthropometric data represent light clothing measurements, suitable allowances in design-critical dimensions should be made for heavy clothing, protective equipment, and other worn or carried items when utilizing these data for design criteria.

**D6.1.5. Clearance dimensions.** Clearance dimensions (e.g., for accesses), which must accommodate or allow passage of the body or parts of the body, should accommodate the 95<sup>th</sup> percentile values for applicable body dimensions.

**D6.1.6. Limiting dimensions.** Limiting dimensions (e.g., reaching distance, control movement, displays, test points) that restrict or are limited by extensions of the body should accommodate the 5<sup>th</sup> percentile values for applicable body dimensions.

**D6.1.7. Control and Display placement.** All controls and visual displays mounted on vertical panels and used in normal equipment operation should be mounted 86 - 178 cm (34 - 70 in) above the standing surface.

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**TABLE I.**

**Anthropometric data for clothed personnel, standing position**

	Percentile Values in Centimeters (Inch equivalents in Parentheses)*			
	5 <sup>th</sup> Percentile		95 <sup>th</sup> Percentile	
	Men	Women	Men	Women
1. Weight (Fig. 1)	65.2 Kg (143 lbs)	50 Kg (110 lbs)	101.7 Kg (224 lbs)	80.6 Kg (177 lbs)
2. Stature (Fig. 1)	168.3 (66.3)	156.2 (61.5)	190.9 (75.2)	177.5 (69.9)
3. Eye height (Fig. 2)	156.6 (61.7)	145.3 (57.2)	178.1(70.1)	165.9 (65.3)
4. Shoulder (Acromiale) height (Fig. 2)	138.0 (54.3)	126.8 (49.9)	158.4 (62.4)	147.0 (57.9)
5. Chest (Nipple) height (Fig. 2)	122.4 (48.2)	112.7 (44.4)	141.1 (55.6)	131.1 (51.6)
6. Elbow (Radiale) height (Fig. 2)	106.1 (41.8)	99.9 (39.3)	123.7 (48.7)	114.8 (45.2)
7. Fingertip (Dactylion) height (Fig. 2)	62.9 (24.8)	58.9 (23.2)	76.2 (30.0)	70.8 (27.9)
8. Waist (Iliocristale) height (Fig. 2)	99.1 (39.0)	94.9 (37.4)	119.7 (47.1)	110.9(43.7)
9. Crotch height (Fig. 2)	79.1 (31.1)	71.9 (28.3)	95.6 (37.6)	88.4 (34.8)
10. Knee (Mid-Patella) height (Fig. 2)	49.9 (19.6)	45.5 (17.9)	59.0 (23.2)	54.1 (21.3)
11. Functional (Thumbtip) reach (Fig. 3)	71.7 (28.2)	67.7 (26.7)	88.6 (34.9)	80.5 (31.7)
12. Functional reach, extended (Fig 3)	80.5 (31.7)	73.5 (28.9)	94.2 (37.1)	92.3 (36.3)
13. Overhead reach height (Fig. 3)	200.4 (78.9)	185.3 (73.0)	230.5 (90.8)	215.1 (84.7)

\* Data derived from MIL-HDBK-759, Table 16a. Weights were adjusted from nude body by adding 3.61 kgs (7.97 lbs) for Battle Dress Uniform, underwear, belt and boots. Heights were adjusted from nude body by adding 3.81 cm (1.5 in) for combat boot heel.

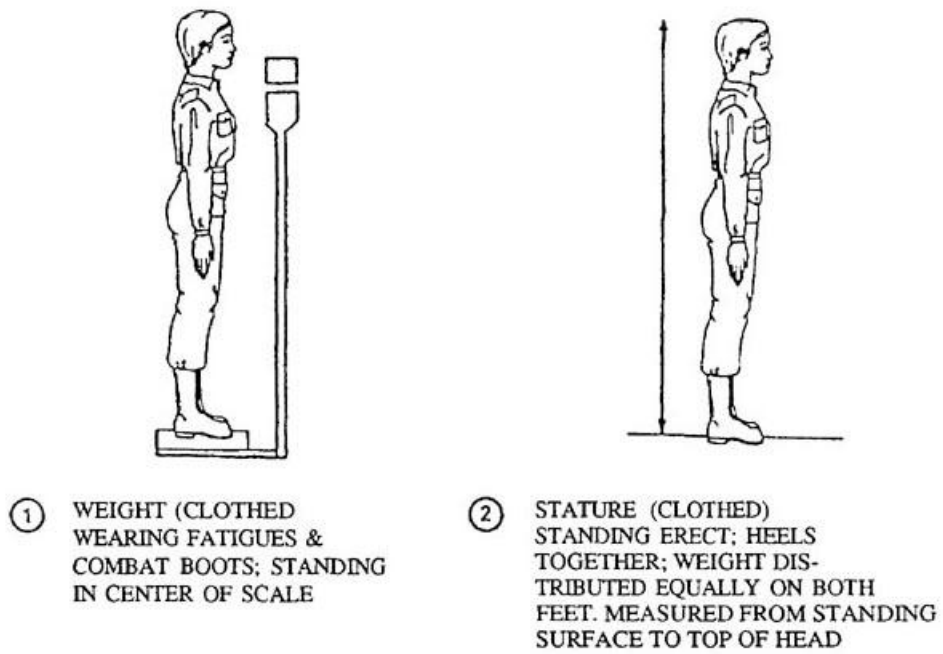


FIGURE 1. Anthropometric data for the standing position, weight and stature

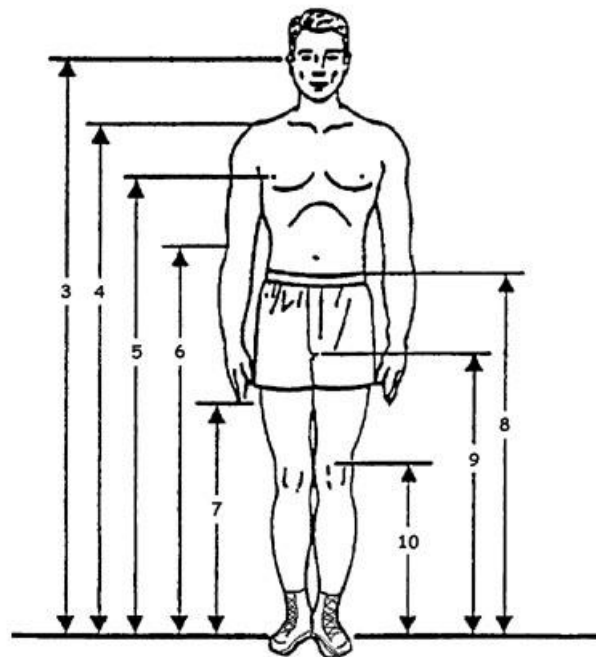
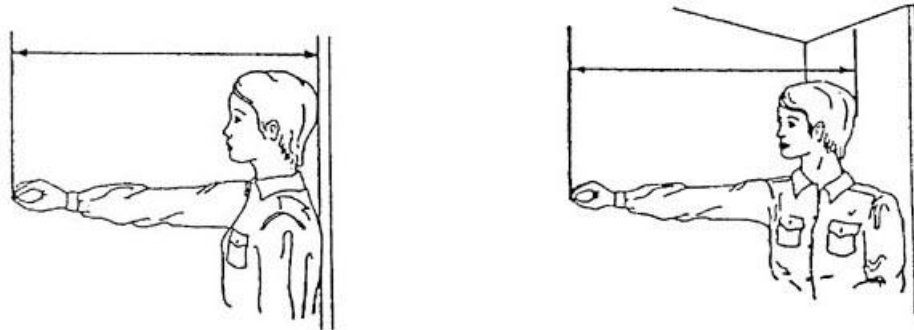
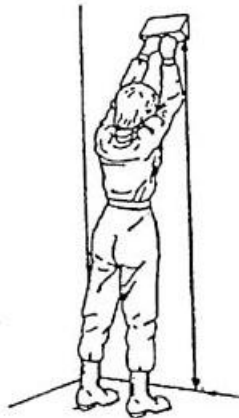


FIGURE 2. Standing body dimensions



⑪ FUNCTIONAL REACH - STANDING ERECT; LOOKING STRAIGHT AHEAD; BOTH SHOULDERS AGAINST WALL; RIGHT ARM HORIZONTAL. MEASURED FROM WALL TO TIP OF THUMB.

⑫ FUNCTIONAL REACH, EXTENDED - STANDING ERECT; LOOKING STRAIGHT AHEAD; RIGHT SHOULDER EXTENDED AS FAR FORWARD AS POSSIBLE WHILE BACK OF LEFT SHOULDER FIRMLY AGAINST WALL; ARM HORIZONTAL. MEASURED FROM WALL TO TIP OF THUMB.



⑬ OVERHEAD REACH HEIGHT - STANDING WITH HEELS 23 cm APART AND TOES 15 cm FROM WALL; ARMS EXTENDED OVERHEAD WITH FISTS TOUCHING AND AGAINST WALL; 1st PHALANGES HORIZONTAL. MEASURED FROM FLOOR TO HIGHEST POINT ON 1st PHALANGES

FIGURE 3. Standing reach

## D6.2. Body movement.

D6.2.1. Range of motion. Table 2 gives the ranges, in angular degrees, for all voluntary movements the joints of the body can make, as illustrated in Figure 4. The designer should remember that these are maximum values; since they were measured with nude personnel, they do not reflect the restrictions clothing would impose. The lower limit should be used when



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personnel must operate or maintain an item; the upper limit should be used in designing for freedom of movement.

D6.2.2. Whole body. All operating positions should allow enough space to move the trunk of the body. When large forces [more than 13.6 kg (30 lbs)] or large control displacements [more than 380 mm (15 in) in a fore-aft direction] are required, the operator should have enough space to move his entire body.

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TABLE II.  
**Range of human motion<sup>1</sup>**

Body Member	Movement	Lower Limit (degrees)	Average (degrees)	Upper Limit (degrees)
A. Wrist	1. Flexion	78	90	102
	2. Extension	86	99	112
	3. Adduction	18	27	36
	4. Abduction	40	47	54
B. Forearm	1. Supination	91	113	135
	2. Pronation	53	77	101
C. Elbow	1. Flexion	132	142	152
D. Shoulder	1. Lateral Rotation	21	34	47
	2. Medial Rotation	75	97	119
	3. Extension	47	61	75
	4. Flexion	176	188	190
	5. Adduction	39	48	57
	6. Abduction	117	134	151
E. Hip	1. Flexion	100	113	126
	2. Adduction	19	31	43
	3. Abduction	41	53	65
	4. Medial Rotation (prone)	29	39	49
	5. Lateral Rotation (prone)	24	34	44
	6. Lateral Rotation (sitting)	21	30	39
	7. Medial Rotation (sitting)	22	31	40
F. Knee Flexion	1. Prone	115	125	135
	2. Standing	100	113	126
	3. Kneeling	150	159	168

<sup>1</sup>These values are based on the nude body. The ranges are larger than they would be for clothed personnel.

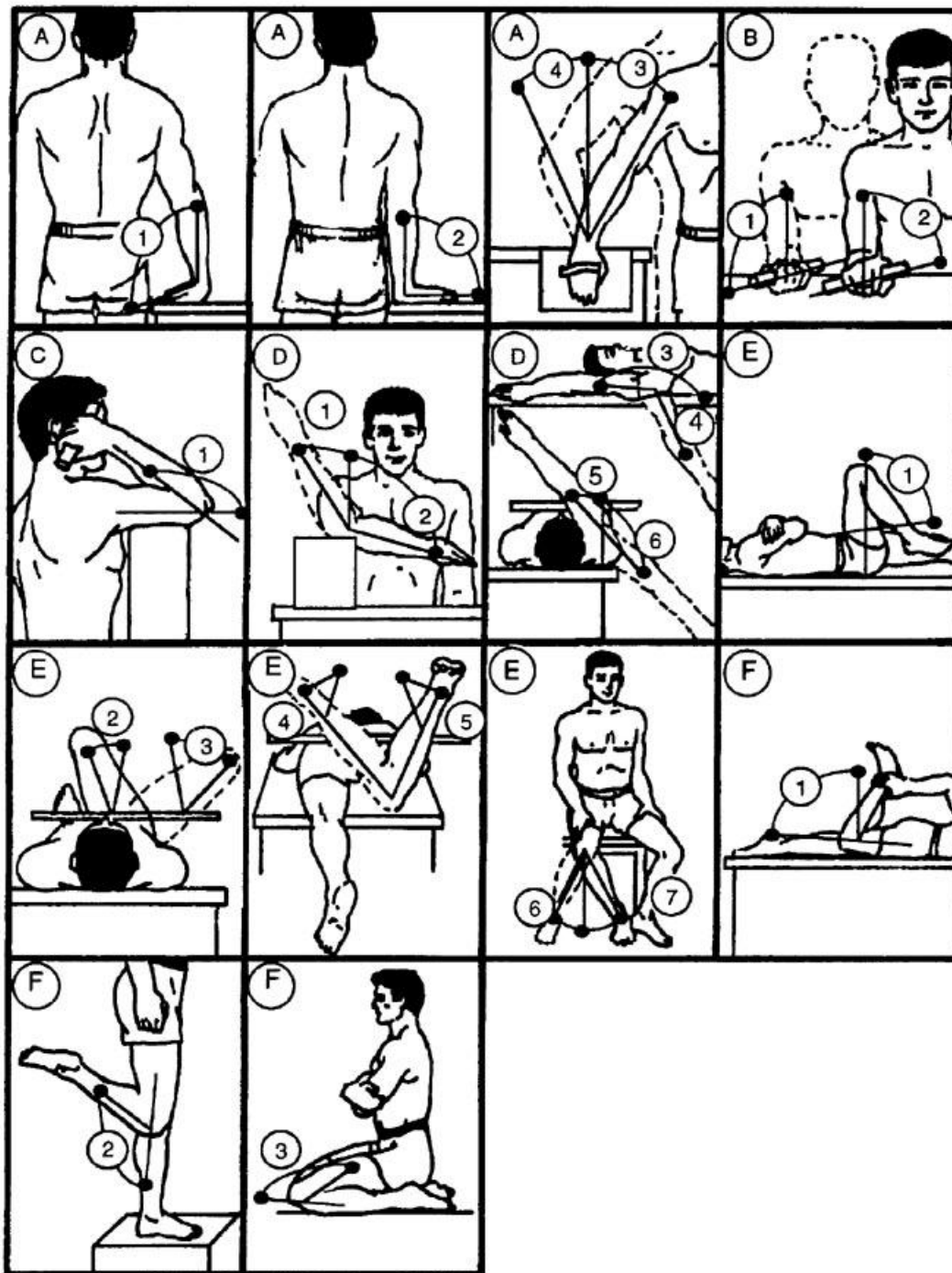


FIGURE 4. Range of human motion

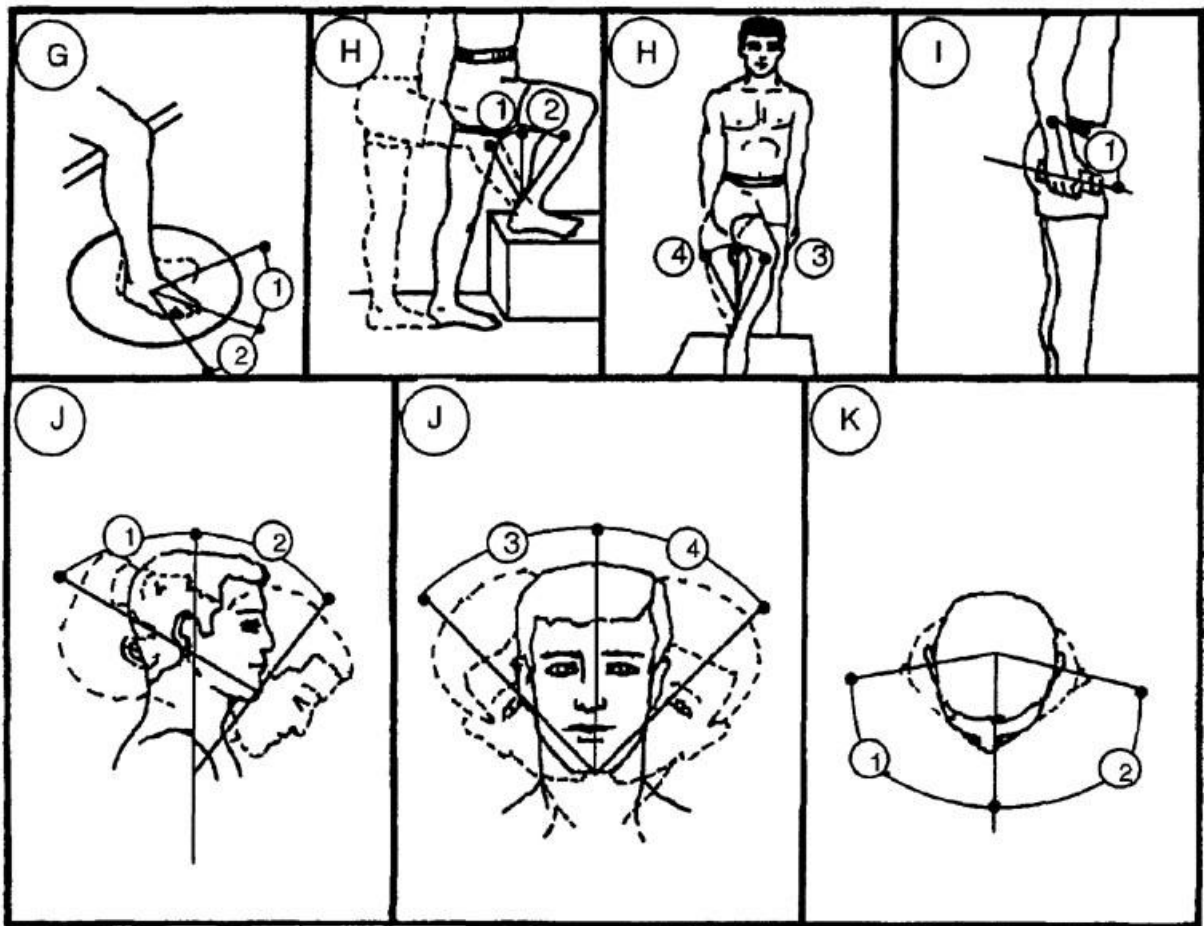


FIGURE 4. Range of human motion - continued

TABLE II.  
Range of human motion - continued <sup>1</sup>

Body Member	Movement	Lower Limit (degrees)	Average (degrees)	Upper Limit (degrees)
G. Foot Rotation	1. Medial	23	35	47
	2. Lateral	31	43	55
H. Ankle	1. Extension	26	38	50
	2. Flexion	28	35	42
	3. Adduction	15	24	33
	4. Abduction	16	23	30
I. Grip Angle		95	102	109
J. Neck Flexion	1. Dorsal (back)	44	61	88
	2. Ventral (forward)	48	60	72
	3. Right	34	41	48
	4. Left	34	41	48
K. Neck Rotation	1. Right	65	79	93
	2. Left	65	79	93

<sup>1</sup>These values are based on the nude body. The ranges are larger than they would be for clothed personnel.

Flexion: Bending or decreasing the angle between parts of the body.

Extension: Straightening or increasing the angle between parts of the body.

Adduction: Moving toward the midline of the body.

Abduction: Moving away from the midline of the body.

Medial Rotation: Turning toward the midplane of the body.

Lateral Rotation: Turning away from the midplane of the body.

Pronation: Rotation of the palm of the hand downward.

Supination: Rotation of the palm of the hand upward.

### D6.3. Push and pull forces.

D6.3.1. Horizontal. Manual horizontal push and pull forces required to be applied or to be sustained over a short period of time should not exceed the values of Table III, as applicable, or those given in Table IV, if more appropriate to the force and movement characteristics of the task.

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TABLE III.

**Horizontal push and pull forces exerable intermittently or for short periods of time**

HORIZONTAL FORCE <sup>1</sup>	APPLIED WITH <sup>2</sup>	CONDITION ( $\mu$ = Coefficient of Friction)
100N (25 lb) push or pull	both hands or one shoulder or the back	Low traction: $0.2 < \mu < 0.3$
200N (45 lb) push or pull	both hands or one shoulder or the back	Medium traction: $\mu \sim 0.6$
300N (70 lb) push or pull	both hands or one shoulder or the back	High traction: $\mu > 0.9$

<sup>1</sup>May be doubled for two and tripled for three operators pushing simultaneously. For the fourth and each additional operator, not more than 75% of their push capability should be added.

<sup>2</sup>See figure 5 for examples.

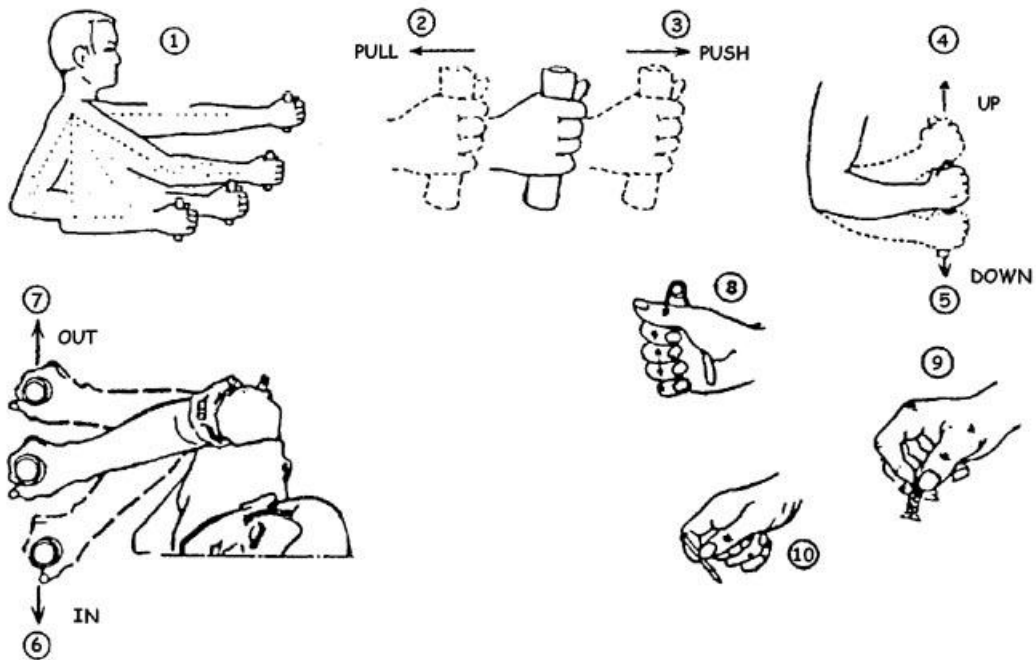
Note: Values are predicated upon a suitable surface for force exertion, i.e., a vertical, rough surface, approximately 40 cm (16 in) wide, and 510 - 127 cm (20 - 50 in) above the floor to allow force application with the hands, the shoulder, or the back.

This table is an excerpt of MIL-STD-1472, Table XXIV. The data are normally considered to apply to the male population only. Here they are applied to the female population as well, on the presumption that females meeting the strength requirements for Maintenance Workers will of necessity have a body mass at least equal to that of the 5<sup>th</sup> percentile male in the general population.



FIGURE 5. Examples of push force conditions for Table III

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ARM STRENGTH (N)												
(1)	(2)		(3)		(4)		(5)		(6)		(7)	
DEGREE OF ELBOW FLEXION (deg)	PULL		PUSH		UP		DOWN		IN		OUT	
	L*	R*	L	R	L	R	L	R	L	R	L	R
180	222	231	187	222	40	62	58	76	58	89	36	62
150	187	249	133	187	67	80	80	89	67	89	36	67
120	151	187	116	160	76	107	93	116	89	98	45	67
90	142	165	98	160	76	89	93	116	71	80	45	71
60	116	107	98	151	67	89	80	89	76	89	53	76
HAND, AND THUMB-FINGER STRENGTH (N)												
	(8)		(9)		(10)							
	HAND GRIP		THUMB-FINGER GRIP (PALMER)		THUMB-FINGER GRIP (TIPS)							
	L	R										
MOMENTARY HOLD	250	260	60		60							
SUSTAINED HOLD	145	155	35		35							

\* L = LEFT; R = RIGHT



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**TABLE IV. Arm, hand and thumb-finger strength (5<sup>th</sup> percentile male data)**

D6.3.2. Vertical. Manual vertical push and pull forces required should not exceed the applicable fifth percentile peak or mean force values cited for men in Table V, or those given in Figure 6, if more appropriate to the force and movement characteristics of the task.

Table V.

**Static Muscle Strength Data**

Strength measurements	Percentile Values in Newtons (Pounds)			
	5 <sup>th</sup> Percentile		95 <sup>th</sup> Percentile	
	Men	Wome n	Men	Wome n
(see Figure 6)				
A Standing two-handed pull:				
38 cm level				
Mean force	738(166)	331(74)	1354(304)	818(184)
Peak force	845(190)	397(89)	1437(323)	888(200)
B Standing two-handed pull:				
50 cm level				
Mean force	758(170)	326(73)	1342(302)	841(189)
Peak force	831(187)	374(84)	1442(324)	905(203)
C Standing two-handed pull:				
100 cm level				
Mean force	444(100)	185(42)	921(209)	443(100)
Peak force	504(113)	218(49)	988(222)	493(111)
D Standing two-handed push:				
150 cm level				
Mean force	409(92)	153(34)	1017(229)	380(85)
Peak force	473(106)	188(42)	1094(246)	430(97)
E Standing one-handed pull:				
100 cm level				
Mean force	215(48)	103(23)	628(141)	284(64)
Peak force	259(58)	132(30)	724(163)	322(72)

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- A. STANDING TWO-HANDED PULL: 38 cm (15") LEVEL  
STANDING WITH FEET 45 cm (18") APART AND KNEES BENT. BENDING AT WAIST, GRASPING BOTH SIDES, OF 45 cm (18") LONG HANDLE LOCATED DIRECTLY IN FRONT, 38 cm (15") ABOVE STANDING SURFACE, AND PULLING, USING PRIMARILY ARMS, SHOULDERS AND LEGS.



- B. STANDING TWO-HANDED PULL: 50 cm (20") LEVEL  
STANDING WITH FEET 45 cm (18") APART AND KNEES STRAIGHT. BENDING AT WAIST, GRASPING BOTH SIDES OF 45 cm (18") LONG HANDLE LOCATED DIRECTLY IN FRONT, 50 cm (20") ABOVE STANDING SURFACE, AND PULLING, USING PRIMARILY ARMS AND SHOULDERS.



- C. STANDING TWO-HANDED PULL: 100 cm (39") LEVEL  
STANDING ERRECT WITH FEET 45 cm (18") APART, GRASPING BOTH SIDES OF 45 cm (18") LONG HANDLE LOCATED DIRECTLY IN FRONT, 100 cm (39") ABOVE STANDING SURFACE, AND PULLING, USING THE ARMS.



- D. STANDING TWO-HANDED PUSH: 150 cm (59") LEVEL  
STANDING ERRECT WITH FEET 45 cm (18") APART, GRASPING FROM BELOW, BOTH SIDES OF 45 cm (18") LONG HANDLE LOCATED DIRECTLY IN FRONT, 150 cm (59") ABOVE STANDING SURFACE. PUSHING UPWARD USING ARMS AND SHOULDERS.



- E. STANDING ONE-HANDED PULL: 100 cm (39") LEVEL  
STANDING ERRECT WITH FEET 15 cm (6") APART, DOMINANT HAND GRASPING UNDERSIDE OF D-RING LOCATED DIRECTLY TO THE SIDE, 100 cm (39") ABOVE STANDING SURFACE. PULLING UPWARD WHILE KEEPING SHOULDER SQUARE AND OTHER ARM RELAXED AT SIDE.

**FIGURE 6. Static muscle strength data**

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**D6.4. Weight.**

**D6.4.1. Lifting limits.** The weight limits in Table VI, conditions A and B, should be used as maximum values in determining the design weight of items requiring one person lifting with two hands. The weight limits in Table VI plus 18 kg (40 lb) should be used as the maximum values in determining the design weight of items requiring two person lifting, provided the load is uniformly distributed between the two lifters. If the weight of the load is not uniformly distributed, the weight limit of Table VI applies to the heavier lift point. Where three or more persons are lifting simultaneously, not more than 14 kg (30 lb) may be added for each additional lifter, provided that the object lifted is sufficiently large that the lifters do not interfere with one another while lifting. Where it is not possible to define the height to which an object will be lifted in operational use, the limit wherein the object is lifted to shoulder height should be used rather than the more permissive bench height value. The values in Table V are applicable to objects with or without handles.

**TABLE VI.**  
**Design weight limits**

HANDLING FUNCTION	POPULATION*
	Male and Female
A. Lift an object from the floor and place it on a surface not greater than 152 cm (5 ft) above the floor.	36.4 kg (80 lb)
B. Lift an object from the floor and place it on a surface not greater than 91 cm (3 ft) above the floor.	53.6 kg (110 lb)
C. Carry an object 7.6 m (25 ft) or less.	53.6 kg (70 lb)

\* Data from MIL-STD-1472 adjusted to reflect the physical requirements for Mechanics and Repairers, Military Occupational Specialty (MOS) 62 & 63 Series, in accordance with MIL-STD-1472 paragraph 1.4 and DA PAM 611-21.

**D6.4.2. Load size.** The maximum permissible weight lift limits in Table V apply to an object with uniform mass distribution and a compact size not exceeding 46 cm (18 in) high, 46 cm (18

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in) wide, and 30 cm (12 in) deep (away from the lifter). This places the handholds at half the depth, or 15 cm (6 in) away from the body. If the depth of the object exceeds 61 cm (24 in) the permissible weight should be reduced by 33 percent. If the depth of the object exceeds 91 cm (36 in), the permissible weight should be reduced by 50 percent. If the depth of the object exceeds 122 cm (48 in), the permissible weight should be reduced by 66 percent.

D6.4.3. Obstacles. The values in Table V assume that there are no obstacles between the person lifting and the shelf, table, bench or other surface on which the object is to be placed. Where a lower protruding shelf or other obstacle limits the lifter's approach to the desired surface, the weight limit of the object should be reduced by 33 percent

D6.4.4. Carrying limits. The weight limit in Table V condition C should be used as the maximum value in determining the design weight of items requiring one person carrying of objects a distance of up to 7.6 m (25 ft). The maximum permissible weight for carrying an object with a handle on top, such as a tool box, which usually is carried at the side with one hand, is 36 kg (80 lbs). The one-person weight carrying limit plus 18 kg (40 lbs) should be used as the maximum value in determining the design weight of items requiring two-person carrying, provided the load is uniformly distributed between the two carriers. Where three or more persons are carrying a load together, not more than 14 kg (30 lbs) may be added for each additional person, provided that the object is sufficiently large that the workers do not interfere with one another while carrying the load. In all cases involving carrying, it is assumed that the object is first lifted from the floor, carried a distance of 7.6 m (25 ft) or less, and placed on the floor or on another surface not higher than 91 cm (36 in). If the final lift is to a higher height, the 152 cm (5 ft) lift height applies as the more limiting case.

D6.4.5. Object carry size. The reduction formula expressed in paragraph B5.3.2 should be applied to size of objects to be carried in the same manner as for load size.

D6.4.6. Labeling. Items weighing more than 18 kg (40 lb) should be prominently labeled with the weight of the object. Where mechanical or power lift is required, hoist and lift points should be provided and clearly labeled.

D6.5. Handles and grasp areas.

D6.5.1. General. All items designed to be carried or removed and replaced should be provided with handles or other suitable means for grasping, handling, and carrying by a gloved or mittened hand. Items requiring handling should be provided with not less than two handles or one handle and one grasp area. Items weighing less than 4.5 kg (10 lb) whose form factor permits them to be handled easily should be exempt from this requirement.

D6.5.2. Location. Whenever possible, handles, grasp areas, or hoist points should be located above the center of gravity and in a manner to preclude uncontrolled swinging or tilting when lifted. They should be located to provide at least 5 cm (2 in) of clearance from obstructions during handling. The location of handles should not interfere with installing, removing, operating, or maintaining the equipment.

D6.5.3. Nonfixed handles. Nonfixed handles (e.g., hinged or fold-out) should have a stop position for holding the handle perpendicular to the surface on which it is mounted and should be

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capable of being placed into carrying position by one hand (where appropriate, by a gloved or mittened hand).

D6.5.4. Grasp surface. Where an item's installation requires that its bottom surface be used as a handhold during removal or installation, a nonslip grasp surface (e.g., grooved, knurled, or frictional) should be provided.

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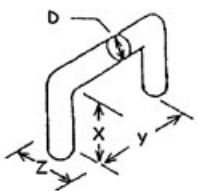
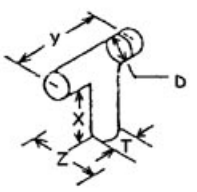
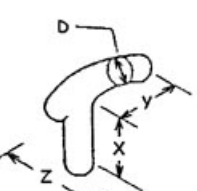
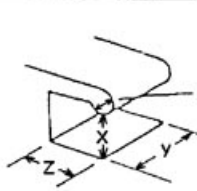
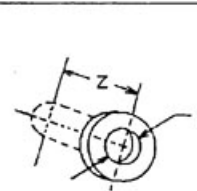
ILLUSTRATION	TYPE OF HANDLE	DIMENSIONS IN mm (in inches)								
		'Bare Hand)			(Gloved Hand)			(Mittened Hand)		
		X	Y	Z	X	Y	Z	X	Y	Z
	Two-finger bar	32 (1-1/4)	65 (2-1/2)	75 (3)	38 (1-1/2)	75 (3)	75 (3)	Not Applicable		
	One-hand bar	48 (1-7/8)	111 (4-3/8)	75 (3)	50 (2)	125 (5)	100 (4)	75 (3)	135 (5-1/4)	150 (6)
	Two-hand bar	48 (1-7/8)	215 (8-1/2)	75 (3)	50 (2)	270 (10-1/2)	100 (4)	75 (3)	280 (11)	150 (6)
	T-bar	38 (1-1/2)	100 (4)	75 (3)	50 (2)	115 (4-1/2)	100 (4)	Not Applicable		
	J-bar	50 (2)	100 (4)	75 (3)	50 (2)	115 (4-1/2)	100 (4)	75 (3)	125 (5)	150 (6)
	Two-finger recess	32 (1-1/4)	65 (2-1/2)	50 (2)	38 (1-1/2)	75 (3)	50 (2)	Not Applicable		
	One-hand recess	50 (2)	110 (4-1/4)	90 (3-1/2)	90 (3-1/2)	135 (5-1/4)	100 (4)	90 (3-1/2)	135 (5-1/4)	125 (5)
	Finger-tip recess	19 (3/4)	—	13 (1/2)	25 (1)	—	19 (3/4)	Not Applicable		
	One-finger recess	32 (1-1/4)	—	50 (2)	38 (1-1/2)	—	50 (2)	Not Applicable		
Curvature of Handle or Edge (DOES NOT PRECLUDE USE OF OVAL HANDLES)		Weight of Item Up to 6.8 kg (up to 15 lbs) 6.8 to 9.0 kg (15 to 20 lbs) 9.0 to 18 kg (20 to 40 lbs) Over 18 kg (over 40 lbs) T-bar Post			Minimum Diameter D - 6 mm (1/4 in) D - 13 mm (1/2 in) D - 19 mm (3/4 in) D - 25 mm (1 in) T - 13mm (1/2 in)			Gripping efficiency is best if finger can curl around handle or edge to any angle of $\frac{2}{3} \pi$ rad (120°) or more.		

Table VII. Minimum handle dimensions

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D6.5.5. Handle dimensions. Handles that are to be used with mittened, gloved, or ungloved hands should equal or exceed the minimum applicable dimensions shown in Table VII.

D6.5.6. Handle and grasp area force requirements. Force requirements to operate handle and grasp areas should not exceed the values in Table IV.

D6.5.7. Handle material. Handles or grasp areas used with bare hands should have surfaces that are not thermally (see thermal contact hazards paragraph) or electrically conductive. The surface should be sufficiently hard to prevent embedding of grit and grime during normal use.

D6.6. Vibration. Equipment oscillations should not impair human performance with respect to control manipulations or the readability of numerals or letters. Equipment vibrations in the range of 1 to 4 Hz having an acceleration greater than 8 feet per second (rms) should be avoided.

D6.7. Storage.

D6.7.1. General.

D6.7.1.1. Standardization. Standard containers should be used whenever practicable and should meet the human engineering criteria herein.

D6.7.1.2. Ease of replacement. Equipment should be configured for removal and replacement by one person where permitted by structural, functional, and weight limitations.

D6.7.1.3. Clothing constraints. Equipment should be capable of being removed and replaced by personnel wearing personal protective and special purpose clothing and equipment, including NBC protective clothing in an NBC contaminated environment.

D6.7.1.4. Removal. Stored items should be removable along a straight or slightly curved line, rather than through an angle.

D6.7.1.5. Limit stops. Limit stops should be provided on drawers. Drawers should be self-locking in the retracted and extended positions. The limit stop design should permit convenient overriding of stops for drawer removal.

D6.7.1.6. Covers or panels. Removal of any stored item should require opening or removing a minimum number of covers.

D6.7.2. Mounting of items within units.

D6.7.2.1. Similar items. Similar items and containers should utilize a common mounting design and orientation within the unit. Similar items and containers should be made distinguishable by labeling, color coding, or marking.

D6.7.2.2. Delicate items. Components susceptible to personnel-induced damage (e.g., rough handling, abrasion, or contamination) should be clearly identified and guarded from abuse both physically and procedurally.

D6.7.2.3. Accessibility.

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D6.7.2.3.1 Structural members. Structural members or permanently installed equipment should not visually or physically obstruct removal and replacement of stored equipment. Equipment restraining devices should be directly visible and physically accessible to the user.

D6.7.2.3.2 Large items. Large items which are difficult to remove should be so mounted that they will not prevent convenient access to other items.

D6.7.2.3.3 Relative accessibility. Items requiring most frequent access should be most accessible.

D6.7.2.4. Storage containers.

D6.7.2.4.1 Securing of covers. It should be obvious when a storage container door or lid is not secured, even though it may be in place.

D6.7.2.4.2 Instructions. If the method of opening a storage container is not obvious from the construction of the container itself, instructions should be permanently displayed on the outside of the container. Instructions should consist of simple symbols such as arrows or simple words such as “push” or “push and turn.”

D6.7.2.4.3 Clearance. Bulkheads, brackets, and other equipment should not obstruct visual or physical access for removal, replacement, or opening of storage containers. Covers, doors or panels which must be opened to remove or replace equipment and supplies should be visually and physically accessible to the user.

D6.7.2.4.4 Self-supporting covers. Hinged lids and doors should be self-supporting in the open position. The cover in the open position should not obstruct required visual or physical access to the stored equipment. Self-supporting covers should be capable of being opened and closed with one hand.

D6.7.2.5. Labeling. Each storage container should be labeled with nomenclature for the items it contains. Accesses should be labeled with warning signs disclosing any hazards existing within the storage area and prescribing precautions. Opening or removing an access cover should not remove or visually obstruct any hazard warning.

D6.7.2.6. Rounding. Cover and access edges should be rounded (See safety paragraph on edge rounding) to preclude hand injury or clothing damage.

D6.7.3. Physical access.

D6.7.3.1. Arm and hand access. Openings provided for access to stored equipment should be sized to permit the required handling and should provide an adequate view of the item being manipulated. All blind arm and hand access should require approval of the procuring activity.

D6.7.3.2. Opening covers. Access covers should be equipped with grasp areas or other means for opening them. Covers should accommodate handwear or special clothing that may be worn by the maintainer.

D6.7.3.3. Reach access dimensions and shape. The dimensions of access openings should be not less than those shown in Table VIII. Allowance should be made for the clearance of the operator's hand, applicable handwear, and clothing. Access shape should provide clearance for



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the equipment (including its protuberances, attachments and handles) that the user must pass through the opening, appropriate body parts, and tools.

D6.7.3.4. Guarding hazardous conditions. If a hazardous condition exists behind the access, the presence of the hazard should be noted on the cover such that it remains visible when the access is open.

D6.7.3.5. Type of opening. Where equipment storage is required, the following practices should be followed in order of preference: a. An opening with no cover unless this is likely to degrade system performance, security, safety, or NBC contamination survivability. b. A hand-operated (sliding or hinged) lid or door. c. A hand-operated latched lid .

D6.7.3.6. Access cover attachment. Covers should be secured with the fewest number of simplest-to-operate latches practicable. Latches should be operable by hand. Small, removable covers should be attached to the structure or otherwise retained to prevent loss.

D6.7.4. Attachments. Connected appurtenances, accessories, cables, hoses, and similar items should not interfere with removing, replacing, or carrying a stored item. If such connected appurtenances interfere with these tasks, they should be easily removed or disconnected from the equipment before handling. Easy disconnect should consist of hand operable quick disconnect or standard hand tool operable disconnects in that order of preference.

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# MINIMAL TWO-HAND ACCESS OPENINGS WITHOUT VISUAL ACCESS

## Reaching with both hands to depth of 150 to 490mm:

Light clothing:	Width:	200mm or the depth of reach*
	Height:	125mm
Arctic clothing:	Width:	150mm plus 3/4 the depth of reach
	Height:	180mm

## Reaching full arm's length (to shoulders) with both arms:

Width:	500mm
Height:	125mm

## Inserting box grasped by handles on the front:

13mm clearance around box, assuming adequate clearance around handles

## Inserting box with hands on the sides:

Light clothing:	Width	Box plus 115mm
	‡ Height:	125mm or 13mm around box*
Arctic clothing:	Width:	Box plus 180mm
	‡ Height:	215mm or 15mm around box*

\*Whichever is larger.

‡If hands curl around bottom, allow an extra 38mm for light clothing, 75mm for arctic clothing.

# MINIMAL ONE-HAND ACCESS OPENINGS WITHOUT VISUAL ACCESS

## Empty hand, to wrist:

Bare hand, rolled:	95mm	sq or dia
Bare hand, flat:	55mm	x 100mm or 100mm dia
Glove or mitten:	100mm	x 150mm or 150mm dia
Arctic mitten:	125mm	x 165mm or 165mm dia

## Clenched hand, to wrist:

Bare hand:	95mm	x 125mm or 125mm dia
Glove or mitten:	115mm	x 150mm or 150mm dia
Arctic mitten:	180mm	x 215mm or 215mm dia

## Hand plus 1" dia object, to wrist:

Bare hand:	95mm	sq or dia
Gloved hand:	150mm	sq or dia
Arctic mitten:	180mm	sq or dia

## Hand plus object over 1" in dia, to wrist:

Bare hand:	45mm clearance	around object
Glove or mitten:	65mm clearance	around object
Arctic mitten:	90mm clearance	around object

## Arm to elbow:

Light clothing:	100mm x 115mm
Arctic clothing:	180mm sq or dia
With object:	Clearances as above

## Arm to shoulder:

Light clothing:	125mm sq or dia
Arctic clothing:	215mm sq or dia
With object:	Clearances as above

# MINIMAL FINGER ACCESS TO FIRST JOINT

<u>Push button access:</u>	Bare hand:	32mm dia
	Gloved hand:	38mm dia
<u>Two finger twist access:</u>	Bare hand:	object plus 50mm
	Gloved hand:	object plus 65mm

TABLE VIII. Arm and hand access dimensions

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D7. Design for maintainer.

D7.1. General.

D7.1.1. Standardization. Standard parts should be used whenever practicable and should meet the human engineering criteria herein.

D7.1.2. Special tools. Special tools should be used only when common hand tools cannot be used, when they provide significant advantage over common hand tools, or where required by security considerations. Special tools required for operational adjustment maintenance should be securely mounted within the equipment in a readily accessible location.

D7.1.3. Ease of replacement. Equipment should be configured for removal and replacement by one person where permitted by structural, functional, and weight limitations.

D7.1.4. Assembly and disassembly. Equipment should be capable of being assembled and disassembled in its operational environment by a minimum number of trained personnel wearing clothing appropriate to the operating environment specified for the system maintenance concept.

D7.1.5. Clothing constraints. Equipment should be capable of being removed, replaced, and repaired by personnel wearing personal protective and special purpose clothing and equipment appropriate to the maintenance concept, including NBC protective clothing in an NBC contaminated environment.

D7.1.6. Error-proof design. Improper mounting and installation (including interchange of items of a same or similar form that are not in fact functionally interchangeable) should be prevented by physical measures to ensure proper mounting of items (e.g., alignment devices).

D7.2. Mounting of items within units.

D7.2.1. Similar items. Similar items should utilize a common mounting design and orientation within the unit. This mounting design should preclude interchange of items which are not functionally interchangeable. Similar items that are not functionally interchangeable should be made distinguishable by labeling, color-coding, or marking to prevent unwanted substitution.

D7.2.2. Delicate items. Components susceptible to maintenance-induced damage e.g., rough handling, abrasion, contamination) should be clearly identified and guarded from abuse both physically and procedurally.

D7.2.3. Accessibility.

D7.2.3.1. Structural members. Structural members or permanently installed equipment should not visually or physically obstruct adjustment, servicing, removal of replaceable equipment, or other required maintenance tasks. Panels, cases, and covers removed to access equipment should have the same access requirements as replaceable equipment. Mounting provisions should be directly visible and physically accessible to the maintainers.

D7.2.3.2. Large items. Large items which are difficult to remove should be so mounted that they will not prevent convenient access to other items.

D7.3. Use of tools and test equipment. Check points, adjustment points, test points, cables,

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connectors, and labels should be accessible and visible during maintenance. Sufficient space should be provided for the use of test equipment and other required tools without difficulty or hazard.

D7.3.1. Relative accessibility. Items requiring most frequent access should be most accessible.

D7.3.2. High-failure-rate items. High-failure-rate items should be accessible for replacement without moving non-failed items. Mechanical replacement items should be removable with common hand tools and simple handling equipment.

D7.4. Lubrication.

D7.4.1. General. Configuration of equipment requiring lubrication should permit lubrication and, as applicable, checking of lubricant reservoir levels without disassembly. Extended fittings should be provided to lubricant ports that would not otherwise be readily accessible or visible.

D7.4.2. Labeling. Where lubrication is required, the type of lubricant to be used and the frequency of lubrication should be specified by a label mounted at or near the lube port or grease fitting. A lubrication chart of permanent construction should be mounted at the operator station of the equipment; individual labels should not be required when the equipment has only one type of fitting and uses only one type of lubricant.

D7.5. Covers.

D7.5.1. Case and cover mounting. Cover or shield holes should be large enough for mounting screw clearance without perfect case alignment.

D7.5.2. Securing of covers. It should be made obvious when a cover is not secured, even though it may be in place.

D7.5.3. Instructions. If the method of opening a cover is not obvious from the construction of the cover itself, instructions should be permanently displayed on the outside of the cover. Instructions should consist of simple symbols such as arrows or simple words such as “push” or “push and turn.”

D7.5.4. Clearance. Bulkheads, brackets, and other equipment should not obstruct visual or physical access for removal or opening of covers on equipment within which work must be performed in the installed condition. Covers, doors or panels which must be opened to perform on-site maintenance should be visually and physically accessible to the maintainers.

D7.6. Access openings and covers.

D7.6.1. Application. An access should be provided if frequent maintenance would otherwise require removing a case or covering, or dismantling an item of equipment.

D7.6.2. Self-supporting covers. Hinged access covers that are not completely removable should be self-supporting in the open position. The cover in the open position should not obstruct required visual or physical access to the equipment being maintained or to related equipment during maintenance. Self-supporting covers should be capable of being opened and closed with one hand.

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D7.6.3. Labeling. Each access should be labeled with nomenclature for items visible or accessible through it. Accesses should be labeled with warning signs, disclosing any hazards existing beyond the access and prescribing precautions. Opening or removing an access cover should not remove or visually obstruct any hazard warning. If instructions applying to a covered item appear on a hinged door, the lettering should be oriented to be read when the door is open.

D7.6.4. Rounding. Cover and access edges should be rounded (See safety paragraph on edge rounding) to preclude hand injury or clothing damage.

D7.7. Physical access.

D7.7.1. Arm and hand access. Openings provided for access to interior equipment should be sized to permit the required adjustment or handling and should provide an adequate view of the item being manipulated. All blind arm and hand access should require approval of the procuring activity.

D7.7.2. Opening covers. Access covers should be equipped with grasp areas or other means for opening them. Covers should accommodate handwear or special clothing that may be worn by the maintainer.

D7.7.3. Reach access dimensions and shape. The dimensions of access openings should be not less than those shown in Figure 9. Allowance should be made for the clearance of the operator's hand, applicable handwear, and clothing. Access shape should provide clearance for the equipment (including its protuberances, attachments and handles) that the maintainer must replace through the opening, appropriate body parts, and tools.

D7.7.4. Tool access dimensions. Access openings should be large enough to operate tools required for maintenance of the equipment reached through the access.

D7.7.5. Guarding hazardous conditions. If a hazardous condition (such as exposed, high voltage conductors) exists behind the access, the physical barrier over the access should be equipped with an interlock that will de-energize the hazardous equipment when the barrier is open or removed. Both the presence of the hazard and the fact that an interlock exists should be noted on the equipment case or cover such that it remains visible when the access is open. Also see 5.9.9.3.

D7.7.6. Type of opening. Where physical access is required, the following practices should be followed in order of preference: a. An opening with no cover unless this is likely to degrade system performance, safety, or NBC contamination survivability. b. A hand operated (latched, sliding, or hinged) cap or door where dirt, moisture, or other foreign materials might otherwise create a problem. c. A quick-opening cover plate using ¼ turn captive fasteners if a cap will not meet stress requirements or space prevents a hinged cover. d. A screw-down cover, when captive fasteners cannot be used because of stress, structure, or pressurization constraints. Use minimum number of interchangeable screws to fasten door.

D7.7.7. Whole body access. Where whole body access is required, the opening should accommodate 95% of projected maintenance.

D7.7.8. Access cover attachment. Covers should be attached with the fewest number of

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simplest-to-operate fasteners practicable. Fasteners should be operable by hand or by common hand tools in that order of preference. Small, removable covers should be attached to the structure or otherwise retained to prevent loss.

**D7.7.9. Fasteners.**

**D7.7.9.1. General.** The number and diversity of fasteners used should be minimized commensurate with stress, bonding, pressurization, shielding, thermal, and safety requirements. When more than one size or type fastener is used on the same equipment or cover, the fasteners-equipment-cover interface should permit the maintainer to readily distinguish the intended location of each fastener. Finger or hand-operated fasteners should be used when consistent with these requirements. Fasteners requiring non-standard tools should not be used.

**D7.7.9.2. Hinges and tongue-and-slot catches.** Hinges, tongue-and-slot catches and mounting pins should be used to minimize the number of fasteners required.

**D7.7.9.3. Captive fasteners.** Captive fasteners should be used where dropping or losing such items could cause damage to equipment or create a difficult or hazardous removal problem. Captive fasteners should also be provided for access covers requiring frequent removal.

**D7.7.9.4. Quantity.** If a hinged access panel or quick-opening fasteners will not meet stress or safety requirements, the minimum number of fasteners consistent with these requirements should be used.

**D7.7.9.5. Fastener head type.**

**D7.7.9.5.1 High-torque fasteners.** External hex or external double-hex wrenching elements should be provided on all machine screws, bolts or other fasteners requiring more than 14 N•m (10 lbf•ft) of torque. When external wrenching fasteners cannot meet the mechanical function or personnel safety requirements, or in limited access situations, and where use is protected from accumulation of foreign material, internal wrenching fasteners may be used. Direct tool access should be provided to allow for torquing without the use of irregular extensions.

**D7.7.9.5.2 Low-torque fasteners.** External-hex wrenching head, internal-hex wrenching head, combination head (internal-hex or straight recess and external-hex wrenching head), or Torq-set fasteners, should be provided where less than 14 N•m (10 lbf•ft) torque is required. Internal-wrenching fasteners should be provided only where a straight, or convex, smooth surface is required for mechanical function or personnel safety, and where use is protected from accumulation of foreign material (e.g., ice, snow). Straight-slot or cross-recess type internal grip fasteners should not be provided, except as wood fasteners or where these type fasteners are provided on standard commercial items.

**D7.7.9.5.3 Common fasteners.** Whenever possible, identical screw and bolt heads should be provided to allow panels and components to be removed with one tool. Combination bolt heads such as slotted hex head should be selected whenever feasible. Identical fasteners should not be used where removal of wrong fastener can result in equipment damage or change to calibration settings.

**D7.7.9.6. Accessibility.** The heads of mounting bolts and fasteners should be located on surfaces

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readily accessible to the maintainer. Both hand and tool access should be provided to the unthreaded or loosened fastener.

D7.7.9.7. Number of turns. Fasteners for mounting assemblies and subassemblies should require a minimum number of turns, compatible with stress, alignment, positioning, and load considerations. When machine screws or bolts are required, the number of turns and the amount of torque should be no more than necessary to provide the required strength except when a common fastener is utilized. All items requiring removal for daily or more frequently scheduled inspections and servicing should use quick release fasteners.

D7.7.10. Attachments. Connected appurtenances, accessories, cables, hoses, and similar items should not interfere with removing, replacing, or carrying an item. If such connected appurtenances interfere with these tasks, they should be easily removed or disconnected from the equipment before handling. Easy disconnect should consist of hand operable quick disconnect or standard hand tool operable disconnects in that order of preference.

D7.8. Mounting.

D7.8.1. General. Equipment configuration should preclude improper mounting.

D7.8.2. Tools. Items maintained at the organizational level should be replaceable using only common hand tools.

D7.8.3. Removal. Replaceable items should be removable along a straight or slightly curved line, rather than through an angle.

D7.8.4. Limit stops. Limit stops should be provided on drawers. Drawers should be self-locking in the retracted and extended positions. The limit stop design should permit convenient overriding of stops for drawer removal.

D7.8.5. Covers or panels. Removal of any replaceable item should require opening or removing a minimum number of covers or panels.

D7.9. Conductors.

D7.9.1. Cable clamps. Unless wiring ducts or conduits are used, mechanically (not adhesively) mounted cable clamps should be provided to ensure correct routing of electrical cables within and between equipment items to ensure that cables do not hinder or obstruct equipment maintenance, to facilitate the mating of cables with their associated equipment items, and to prevent chafing due to contact with adjacent structure. All clamps should be visible when equipment is installed.

D7.9.2. Cable routing. Cable routing should not obstruct visual or physical access to equipment for storage, operation, or maintenance.

D7.9.3. Access. Cables should be routed so as to be accessible for inspection and maintenance.

D7.9.4. Susceptibility to abuse. Cables should be routed or protected to preclude mechanical damage and abuse, including damage by doors, lids, use as steps or hand holds, or being bent or twisted sharply or repeatedly.

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D7.9.5. Identification. Cables should be labeled to indicate the equipment to which they belong and the connectors with which they mate.

D7.10. Fuses and circuit breakers.

D7.10.1. General. A positive indication should be provided to reveal that a fuse or circuit breaker has opened a circuit.

D7.10.2. Replacement and resetting. Fuses should be readily accessible for removal and replacement. No other components should require removal in order to gain access to fuses. No special tools should be required for fuse replacement unless required by safety considerations. When resetting of circuit breakers is permissible, and is required for system operation during a mission, the breakers should be located within reach of the operator when standing at the control panel.

D7.10.3. Markings. Equipment served by the fuse or circuit breaker should be labeled. Labeling of fuses and circuit breakers should be legible in the anticipated ambient illumination range for the operator's location.

D7.10.4. Circuit breaker controls. Toggle bat and legend switch actuated circuit breakers may be used to control electrical power. Push-pull type breakers should not be used as power switches.

D7.11. Drain valves. Drain valves should be readily accessible and hand-operable by the full range of user personnel wearing either Arctic or NBC garments.

D7.12. Filters. Fuel and oil filters should be located in accessible positions for inspection and replacement and should not require the removal of other parts.

D7.13. Adjustment and access. Components requiring adjustment or replacement, such as fuel injectors and fan belts, should be as accessible as possible.

D8. Labeling

D8.1. General

D8.1.1. Application. Labels, legends, placards, signs, markings, or a combination of these should be provided whenever personnel must identify items (except where it is obvious to the observer what an item is and what he or she is to do with it) or follow procedures.

D8.1.2. Label characteristics. Label characteristics should be consistent with required accuracy of identification, time available for recognition or other responses, distance at which the labels must be read, illuminant level and color, criticality of the function labeled, and label design practices used elsewhere on the SATS.

D8.2. Orientation and location.

D8.2.1. Orientation. Labels and information thereon should be oriented horizontally so that they may be read from left to right. Vertical orientation may be used only when labels are not critical for personnel safety or performance and where space is limited. When used, vertical labels should read from top to bottom.

D8.2.2. Location. Labels should be placed on or very near the items which they identify, so as to



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eliminate confusion with other items and labels. Labels should be located so as not to obscure any other information needed by the operator.

D8.3. Standardization. Labels should be located consistently throughout the system.

D8.4. Contents.

D8.4.1. Equipment functions. Labels should primarily describe the functions of equipment items. Nomenclature may be described as a secondary consideration.

D8.4.2. Irrelevant information. Trade names and other irrelevant information should not appear on labels or placards.

D8.5. Qualities.

D8.5.1. Brevity. Labels should be unambiguous and as concise as possible without distorting the intended meaning or information. Redundancy should be minimized. Where a general function is obvious, only the specific function should be identified (e.g., “rpm” rather than “engine rpm”).

D8.5.2. Familiarity. Words should be familiar to the operator. For specific users (e.g., maintainers), common technical terms may be used even though they may be unfamiliar to nonusers. Abstract symbols (e.g., squares and Greek letters) should be used only when they have an accepted meaning to all intended readers. Common, meaningful symbols (e.g., % and +) may be used.

D8.6. Visibility and legibility. Labels and placards should be easy to read accurately from the operational reading distances and in the anticipated vibration and illumination environments.

D8.7. Access. Item labels should not be covered or obscured by other items.

D8.8. Label life. Labels should be mounted so as to minimize wear or obscurement by grease, grime, or dirt, and should remain legible for the overhaul interval of the labeled equipment.

D8.9. Contrast and background. Label color should contrast with the equipment background.

D8.10. Design of label characters.

D8.10.1. Black characters. Where the ambient illuminance will be above 10 lux (0.9 ft-c), black characters should be provided on a light background.

D8.10.2. Style. Sans serif block letter fonts having the size ratios specified herein should be used. Examples of acceptable commercial fonts are Futura medium, Futura tempo bold, Futura demibold, Airport semibold, Vogue medium, Lining Gothic No. 66, and Alternate Gothic No. 8.

D8.10.3. Capital vs lower case.

D8.10.3.1. Labels. Labels should be printed in all capitals, except where lower case letters or punctuation marks are indigenous to the item being identified.

D8.10.3.2. Legends. Legends should be printed in all capitals, without periods or commas.

D8.10.3.3. Placards. Instructional placards may use capitals and lower case (sentence case) when the message exceeds two lines; however, for short, instructional material, all-capitals are preferred. All-capital material (consisting of a larger cap for the initial letter in a paragraph, line

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of instruction, or procedural step) may be used.

D8.10.3.4. Signs. Signs should consist of all-capitals, except when the sign is instructional and involves several lines of extended sentences, in which case sentence case may be used.

D8.10.3.5. Letter width. The width of letters should be  $\frac{3}{5}$  of the height, except for “M” and “W”, which should be  $\frac{4}{5}$  of the height, and “I,” which should be one stroke wide.

D8.10.3.6. Numeral width. The width of numerals should preferably be  $\frac{3}{5}$  of the height, except for “4,” which should be one stroke width wider, and “1,” which should be one stroke wide.

D8.10.3.7. Wide characters. Where wide characters are required, e.g., for curved surfaces or for column alignment of numbers, the basic height-to-width ratio may be increased to as much as 1:1.

D8.10.3.8. Stroke width, normal. For black characters on a white (or light) background, the stroke width should be  $\frac{1}{6}$  to  $\frac{1}{7}$  of the height.

D8.10.4. Character spacing. The minimum space between characters should be one stroke width.

D8.10.5. Word spacing. Space between words should be not less than the width of one character.

D8.10.6. Line spacing. The minimum space between lines should be one-half character height.

D8.10.7. Size vs luminance. The height of letters and numerals should conform to Table V.

D8.10.8. Character height and viewing distance. See Table IX.

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TABLE IX.  
**Label size versus luminance**

MARKINGS	HEIGHT <sup>1</sup>	
	≤3.5 cd/m <sup>2</sup> (1 ft—L)	>3.5 cd/m <sup>2</sup> (1 ft—L)
Critical markings with position fixed (e.g., safety or emergency instructions)	4—8 mm 0.16 - 0.31 in)	2.5—5 mm (0.10 - 0.20 in)
Noncritical markings (e.g., identification labels, routine instructions, or markings required only for familiarization)	1.3—5 mm (0.05—0.20 in)	1.3—5 mm (0.05—0.20 in)

<sup>1</sup>Values assume a 710 mm (28 in.) viewing distance. For other distances, multiply the above values by D/710 mm (D/28 in.).

**D9. Hazards and safety.**

**D9.1. General.** Design should reflect the safety related human engineering criteria below as well as in other sections of this standard.

**D9.2. General workspace hazards.**

**D9.2.1. Obstructions.** Areas where operation, storage, or maintenance is performed should be free of obstructions which could cause injury to personnel, either through accidental contact with the obstruction or because the obstruction requires an awkward or dangerous body position.

**D9.2.2. Handles.** Handles on equipment should be recessed whenever practicable, to eliminate projections on the surface. If handles cannot be recessed, they should be configured, located, and oriented to preclude injuring personnel or entangling their clothing or equipment.

**D9.2.3. Thermal contact hazards.** Equipment which, in normal operation, exposes personnel to surface temperatures greater or less than those shown below, should be appropriately guarded. Surface temperatures induced by climatic environment are exempt from this requirement.

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<u>Exposure</u>	<u>Temperature limits</u>		
	<u>Metal</u>	<u>Glass</u>	<u>Plastic or wood</u>
Momentary contact	60° C (140° F)	68° C (154° F)	85° C (185° F)
Prolonged contact or handling	49° C (120° F)	59° C (138° F)	69° C (156° F)
Momentary or prolonged contact or handling	0° C (32° F)	0° C (32° F)	0° C (32° F)

D9.2.4. General equipment-related hazards.

D9.2.4.1. Access. Equipment items should be so located and mounted that access to them can be achieved without danger to personnel from electrical, thermal, mechanical, or other hazards.

D9.2.4.2. Edge rounding. Where applicable, all exposed edges and corners should be rounded to a radius not less than 0.75 mm (.03 in). Sharp edges and corners that can present a personal safety hazard or cause equipment damage during usage should be suitably protected or rounded to a radius not less than 13 mm (.05 in).

D9.2.5. Electrical, mechanical, fluid, toxic, and radiation hazards.

D9.2.5.1. Electrical hazards.

D9.2.5.1.1 Insulation of tools. Tools and test leads to be used on or near energized electrical components should be adequately insulated.

D9.2.5.1.2 Plugs and receptacles. Plugs and receptacle configurations should preclude inserting a plug of one voltage rating into a receptacle of another rating.

D9.2.5.1.3 Voltage exposure. All hot contacts should be socket contacts.

D9.2.5.1.4 Dangerous voltage or current. Guards, grounding, interlocks, and warning placards should be provided to minimize exposing personnel to dangerous voltages or currents.

D9.2.5.1.5 Ground potential. Equipment should be designed so that all external parts will be at ground potential.

D9.2.5.1.6 Electrically-operated hand tools. Electrically operated hand-held power tools should be designed with three-wire power cords with one wire at ground potential and should have exposed surfaces which are either non-conducting or are electrically connected to the ground wire. Exposed surfaces include cases, grips, handles, switches, triggers, chucks, and other surfaces which are capable of being contacted during operation. Portable tools which are protected by an approved system of double insulation or its equivalent may be used without a ground wire when approved by the procuring activity.

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D9.2.5.1.7 Batteries. Batteries that have ratings greater than 25 amp hours should have terminal guarding to prevent inadvertent short-circuit. Such guarding should also prevent short-circuiting the battery in spite of clearly improper but possible acts by personnel, such as placing tools across terminals.

D9.2.5.2. Mechanical hazards. A guard should be provided on all moving parts of machinery and power transmission equipment, including pulleys, belts, gears, and blades, on which personnel may become injured or entangled.

D9.2.5.3. Toxic hazards. Personnel should not be exposed to the concentrations of toxic substances in excess of the limits specified in Occupational Safety and Health (OSH) standards.

D9.2.6. Stairs, stair-ladders, fixed ladders, and ramps.

D9.2.6.1. General criteria.

D9.2.6.1.1 Selection. The selection of stairs, stair-ladders, fixed ladders, or ramps for specific applications shall be based on the angle of ascent required and the criteria in Figure 7.

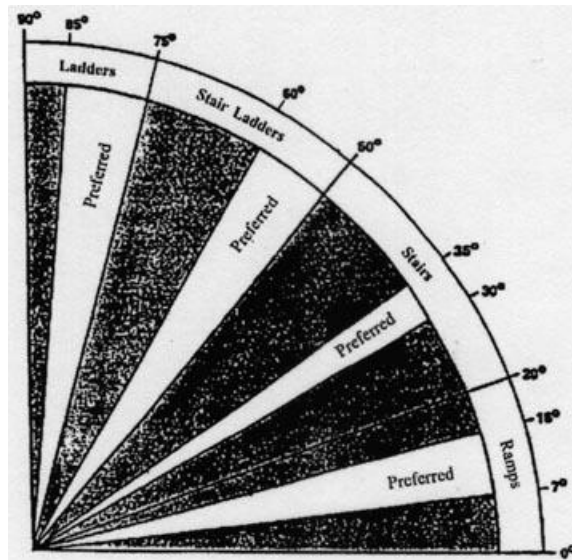


Figure 7. Selection Criteria for Ladders, Stair-Ladders, Stairs, and Ramps

D9.2.6.1.2 Provision for hand-carrying equipment. Ladders and stair-ladders shall not be used where hand-carrying of equipment is required, since both hands should be free to grasp the ladder. Stairs should not be used where hand-carrying bulky loads or loads in excess of 13 kg (29 lbs) is required (see Table I). Ramps, elevators, or equivalent means should be provided when heavy equipment must be manually transported.

D9.2.6.2. Handrails and guardrails. Stairs, stair-ladders, fixed ladders, and ramps should be equipped with a handrail on each side. Where one or both sides are open, appropriate

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intermediate guardrails shall be provided to prevent personnel injury. Non-fixed vehicular-boarding ladders are neither stair ladders nor fixed ladders and are exempt from this requirement.

D9.2.6.3. Stairs. Stair dimensions should conform to the recommended values and shall be within the minimum and maximum limits of Table X.

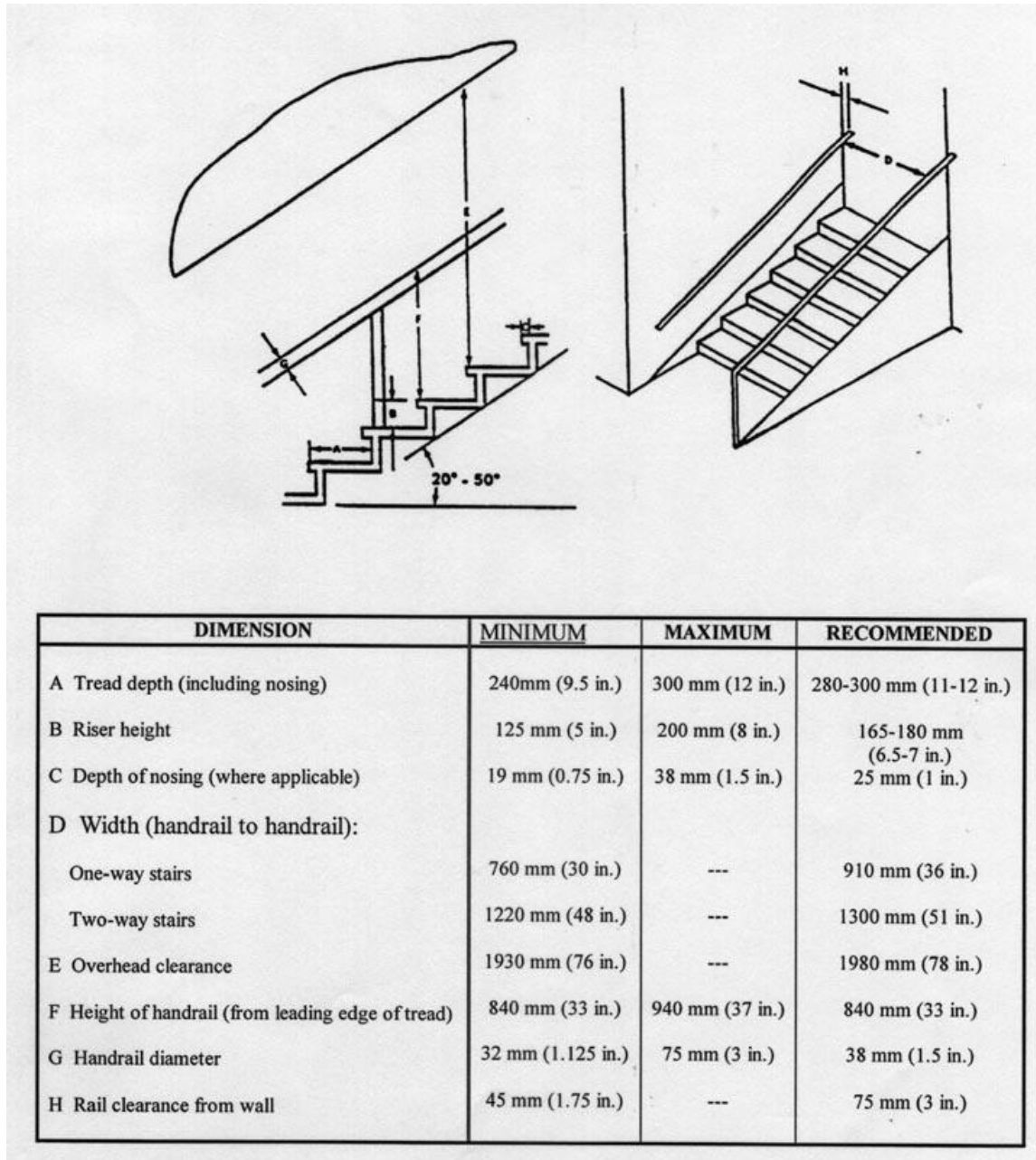
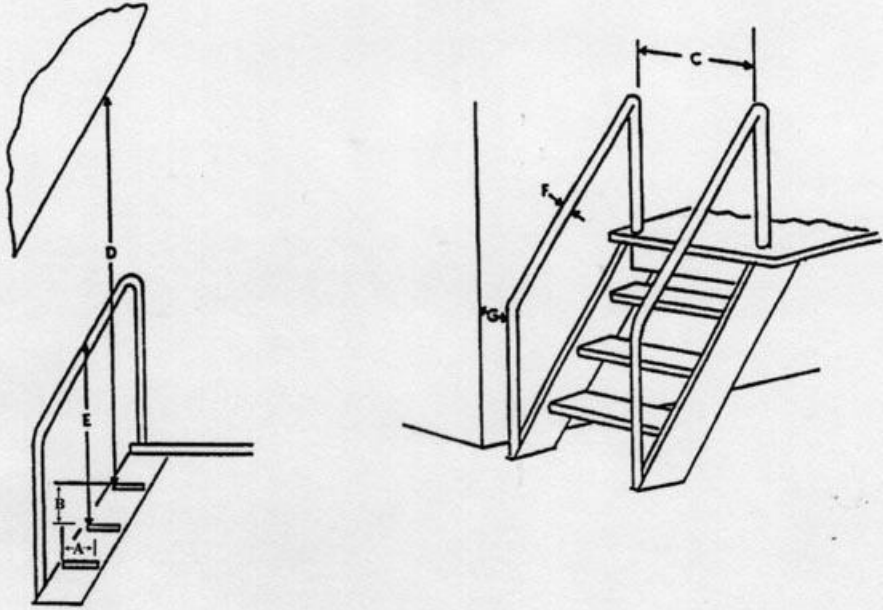


Table X. Stair Dimensions

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D9.2.6.4. Stair ladders. Stair ladder dimensions should conform to the recommended values and shall be within the specified minimum and maximum limits of Table XI. The tread rise shall be open at the rear. Landings should be provided every tenth or twelfth tread. The surface of treads on exterior stair ladders should be constructed of open grating material or should be treated with nonskid material.



DIMENSION	MINIMUM	MAXIMUM	RECOMMENDED
A Tread depth range:			
For 50° rise	150 mm (6 in.)	250 mm (10 in.)	215 mm (8.5 in.)
For 75° rise (open ladders only)	75 mm (3 in.)	140 mm (5.5 in.)	100 mm (4 in.)
B Riser height	180 mm (7 in.)	300 mm (12 in.)	230 mm (9 in.)
C Width (handrail to handrail)	530 mm (21 in.)	610 mm (24 in.)	560 mm (22 in.)
D Overhead clearance	1730 mm* (68 in.)	---	1930 mm (78 in.)
E Height of handrail (from leading edge of tread)	860 mm (34 in.)	940 mm (37 in.)	890 mm (35 in.)
F Handrail diameter	32 mm (1.125 in.)	75 mm (3 in.)	38 mm (1.5 in.)
G Rail clearance from wall	50 mm (2 in.)	---	75 mm (3 in.)

\* Whenever the distance D is less than 1,880 mm (74 in.), the overhead obstruction should be painted with yellow and black stripes.

Table XI. Stair-Ladders

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D10. Trailers, vans, and intervehicular connections.

D10.1. Trailers.

D10.1.1. Brake controls. Trailer brake controls shall be located so that an operator can reach them while restraining or positioning the trailer manually. The controls shall not be located on the side of the trailer exposed to road traffic.

D10.1.2. Positioning controls. Component trailers should contain precise positioning controls when the trailer will be used to mate parts.

D10.1.3. Tie-downs. Munitions tie-down facilities on stores trailers shall be easily installed and removed.

D10.1.4. Landing gear lock. Landing gear lock and release shall be capable of being hand or foot-operated.

D10.2. Vans. The following criteria applies to trailer vans and transportable shelters which serve as shelters for personnel or equipment, and which require occupancy by personnel for operational or maintenance tasks in excess of one hour, on a recurring basis where mission requirements permit:

D10.2.1. Ceiling height. The ceiling height (distance from the floor to the bottom of any light, cable run, or other protuberance over the aisle or standing work-space) shall be not less than 198 cm (78 in) for vans and shelters, except as follows: When the occupants seldom stand to perform normal operations, the ceiling height can be reduced to 189 cm (74.5 in) unless otherwise specified by the procuring activity.

D10.2.2. Access openings. Personnel access openings shall be not less than 193 cm (76 in) high and 76 cm (30 in) wide. Equipment access opening shall accommodate the specific equipment to be transported, including suitable clearances for handling. Access doors shall have provisions for being locked in open positions as well as closed positions. All access doors shall have inner quick-opening releases.

D10.2.3. Steps, stairs, ladders. Steps, stairs, or ladders shall be provided when van floors are more than 46 cm (18 in) above ground level.

D10.3. Inclinometers. On work spaces such as large personnel-occupied vans or shelters, intended for use as mobile work spaces, inclinometers shall be provided to permit readout of front-rear and side-side tilt within  $\pm 2^\circ$ .

D10.4. General. Design shall reflect the safety related human engineering criteria below as well as in other sections of this standard.

D10.5. Safety labels and placards.

D10.5.1. Warning placards. Conspicuous placards shall be mounted adjacent to any equipment which presents a hazard to personnel (e.g., from high voltage, heat, toxic vapors, explosion,



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radiation). Warning placards shall be located to provide an advanced alert of the potential health hazards while not placing the reader at risk to exposure.

D10.5.2. Center-of-gravity and weight. Where applicable, the center of gravity and the weight of equipment shall be distinctly marked.

D10.5.3. Weight capacity. The weight capacity shall be indicated on stands, hoists, lifts, jacks, and similar weight-bearing equipment, so as to prevent overloading.

D10.5.4. Identification of protective items. Areas of operation or maintenance where special protective clothing, tools, or equipment are necessary (e.g., insulated shoes, gloves, suits) shall be specifically identified.

D10.5.5. "NO-STEP" markings. "NO-STEP" markings shall be provided when necessary to prevent injury to personnel or damage to equipment.

D10.5.6. Electrical labels. All receptacles shall be marked with their voltage, phase, and frequency characteristics, as appropriate. For other electrical labeling and warning requirements, see MIL-HDBK-454.

D10.5.7. Hand grasp areas. Hand grasp areas shall be conspicuously and unambiguously identified on the equipment.

D10.5.8. Pipe, hose and tube line identification. Pipe, hose, and tube lines for liquids, gas, steam, and etc., shall be clearly and unambiguously labeled or coded as to contents, pressure, heat, cold, or other specific hazardous properties.

D10.6. General workspace hazards.

D10.6.1. Alerting device. A hazard alert device shall be provided to warn personnel of impending danger or existing hazards (e.g., fire, the presence of combustible or asphyxiating gas, and radiation.).

D10.6.2. Emergency doors and exits. Emergency doors and exits shall be readily accessible, unobstructed, simple to operate, simple to locate in the dark, quick opening in three seconds or less, and require 44 - 133 N (10 - 30 lb) of operating force to open. They shall not themselves, or in operation, constitute a safety hazard. They shall permit one person egress in 5 seconds or less.

D10.6.3. Stairs. Stairs, including incline, step risers, and treads, shall conform with standard safe design practice. Skid-proof flooring, stair, and step treads shall be provided. Where conditions warrant special precaution, surfaces shall be treated with a nonslip coating.

D10.6.4. Obstructions. Workspace around areas where maintenance is performed shall be free of obstructions which could cause injury to personnel, either through accidental contact with the obstruction or because the obstruction requires an awkward or dangerous body position.

D10.6.5. Illumination. Adequate illumination shall be provided in all areas. Warning placards, stairways, and all hazardous areas shall be illuminated in accordance with the recommended levels of Table XXI.

D10.6.6. Electrical hazards.

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D10.6.6.1. Insulation of tools. Tools and test leads to be used near high voltages shall be adequately insulated.

D10.6.6.2. Plugs and receptacles. Plugs and receptacle configurations shall preclude inserting a plug of one voltage rating into a receptacle of another rating.

D10.6.6.3. Voltage exposure. All hot contacts shall be socket contacts.

D10.6.6.4. Dangerous voltage or current. Guards, grounding, interlocks, and warning placards shall be provided to minimize exposing personnel to dangerous voltages or currents.

D10.6.6.5. Ground potential. Equipment shall be designed so that all external parts, other than antenna and transmission line terminals, will be at ground potential.

D10.6.6.6. Electrically-operated hand tools. Electrically operated hand-held power tools shall be designed with three-wire power cords with one wire at ground potential and shall have exposed surfaces which are either non-conducting or are electrically connected to the ground wire. Exposed surfaces include cases, grips, handles, switches, triggers, chucks, and other surfaces which are capable of being contacted during operation. Portable tools, protected by an approved system of double insulation or its equivalent, may be used without a ground wire when approved by the procuring activity.

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APPENDIX E

PERFORMANCE REQUIREMENTS FOR  
FOR  
TRAILER-MOUNTED SETS, KITS, AND OUTFITS

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**E1. SCOPE**

E1.1. Scope. This appendix establishes specific mobility criteria for Sets, Kits and Outfits (SKOs) mounted on Army tactical trailers. This appendix is a mandatory part of this specification. The information contained herein is intended for compliance.

E1.2. Purpose. These requirements are predicated upon the SKO being assembled to a non-standard tactical trailer.

**E2. APPLICABLE DOCUMENTS**

The documents cited in this section are for reference only, and do not constitute a part of this standard. They are provided as a source of additional information.

E2.1. Government documents.

**SPECIFICATIONS**

**DEPARTMENT OF DEFENSE**

MIL-DTL-45150                      - Chassis, Trailer, 2-Wheel Cart Type ¼ to 3-1/2 Ton

**STANDARDS**

**DEPARTMENT OF DEFENSE**

MIL-STD-810                      - Environmental Test Methods and Engineering  
Guidelines

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order desk, 700 Robbins Avenue, Bldg 4D, Philadelphia, PA 19111-5094.)

E2.2. Non-Government publications.

**SOCIETY OF AUTOMOTIVE ENGINEERS**

AS8090                      - Mobility, Towed Aerospace Ground Equipment, General  
Requirements for

(Application for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001).

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**E3. PERFORMANCE**

The trailer-mounted SKO shall perform as follows when being towed by its preferred prime mover.

E3.1. Speed. The trailer-mounted SKO shall trail safely behind its preferred prime mover at all speeds up to and including the maximum recommended for the combination of prime mover, trailer chassis, and towing surface.

E3.2. Tracking.

E3.2.1. Straightaways. When following a straight course, the longitudinal centerline of the trailer-mounted SKO shall remain aligned with the longitudinal centerline of the prime mover. The trailer shall not exhibit excessive crab, yaw, or sway such that the path of the trailer deviates more than three inches to either side of the path of the towing vehicle.

E3.2.2. Turns. On dry, level pavement, the trailer-mounted SKO shall safely trail through turns when the steering mechanism of the prime mover is at its maximum cramping angle. Turns shall be taken at 10 miles per hour or the maximum safe turning speed for the prime mover under the test conditions, whichever is less. When turning, the wheels of the trailer shall follow an arc concentric to that traversed by the wheels of the prime mover. The trailer shall not skid, and shall not tilt or turn over. There shall be no interference between any part of the trailer-mounted SKO and its preferred prime mover at any turning radius the prime mover can execute.

E3.3. Loading ramps. When entering or leaving longitudinal slopes of up to 35% grade (20 degrees from the horizontal) such as a loading ramp, there shall neither be interference between the trailer-mounted SKO and its preferred prime mover nor interference between the trailer-mounted SKO and the towing surface. Traversing the slope shall not damage the SKO, nor shall any component be displaced.

E3.4. Side slopes. When traversing side slopes the centerline of the trailer-mounted SKO shall remain aligned with the centerline of the prime mover and the trailer shall not tilt or turn over.

E3.5. Braking. The trailer-mounted SKO shall withstand sudden stops from initial speeds up to the maximum safe speed for the prime mover without damage and without displacement of any component. When braking, the trailer shall not jackknife and shall not exhibit wheel hop.

**E4. TESTS**

E4.1. Speed and tracking. The fully-loaded trailer-mounted SKO shall be towed by its preferred prime mover. While being towed, the trailer-mounted SKO shall be observed to determine whether the trailer crabs, yaws, or sways. If there is any doubt regarding the extent of deviation between the path of the trailer and the path of the towing vehicle, a visible trail shall be produced by pouring water on the tires (or by other suitable means) and the deviation measured. These observations shall be taken in conjunction with roadability and mobility testing of the SKO.

E4.2. Turning. The trailer-mounted SKO shall be hitched to its preferred prime mover

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and towed in a “figure 8” over smooth, dry pavement. The radius of each turn shall be made progressively smaller, until the prime mover’s maximum cramping angle is reached. The prime mover shall maintain a speed of at least ten miles per hour, or it’s maximum safe speed for that turning raduis, whichever is less. While turning, the trailer-mounted SKO shall be observed to determine whether the trailer skids, tilts, or turns over. If there is any doubt regarding the concentricity between the path of the trailer and the path of the towing vehicle, a visible trail shall be produced by pouring water on the tires (or by other suitable means) and the tracks examined.

E4.3. Loading ramp. The trailer-mounted SKO shall be towed by its preferred prime mover both up and down a ramp inclined at least 20 degrees to the horizontal. The bottom and top of the ramp shall end in horizontal landings that form a sharply defined angle with the ramp. The length of the ramp, measured along the slope, shall be not less than 1.2 times the wheelbase of the vehicle/trailer combination. The Simulated Loading Ramp at Aberdeen Proving Ground (APG) is one example of a suitable facility for the test (See Figure E1).

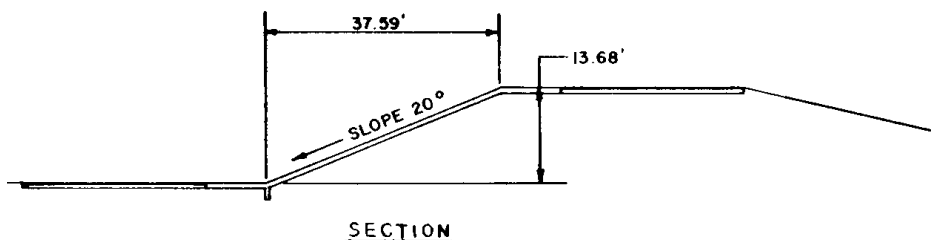


Figure E1. Example of Simulated Loading Ramp

E4.4. Sudden stops. The fully loaded trailer-mounted SKO shall be towed by its preferred prime mover over a clean, dry, smooth, level, high-speed paved road at a speed of at least 20 mph. The brakes shall be suddenly and fully applied (maximum pedal effort braking) to bring the prime mover and trailer to a complete emergency stop. The procedure shall be repeated at successively higher speeds until the maxim safe braking speed is achieved. Road speed shall be increased in increments of 5 mph between stops. The criterion for maximum safe speed at maximum pedal effort is that vehicle slew shall not exceed the limits of a roadway lane width equal to 1.5 times the width of the prime mover. The test shall be repeated with the removable components of the SKO removed from the trailer. During each stop the trailer-mounted SKO shall be observed to determine if axle hop is evident, and whether the trailer jackknifes. Following each stop, the trailer-mounted SKO shall be examined for visible structural damage and for damage to or displacement of any stowed component.

## E5. DEFINITIONS

E5.1. Crab. To move sideways or diagonally (dogwalk). In the specific case of a trailer, to follow a straight course with its longitudinal centerline at an angle to that of the prime mover.

E5.2. Slew. To turn, twist, move, or skid to the side.

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E5.3. Sway. To move back and forth with a swinging motion. In the specific case of a trailer, to move from side to side about the pintle.

E5.4. Skid. To slide or slip sideways. In the specific case of a trailer, to lose traction during a turn so that the trailer slips sideways on its tires in response to centrifugal force.

E5.5. Tilt. To incline, as by raising one end. In the specific case of a trailer, to lean over in response to centrifugal force during a turn to the extent that one or more wheels loses contact with the surface being traversed.

E5.6. Jackknife. To fold or double like a jackknife. In the specific case of a trailer, to swing around the pintle to one side or the other during braking.

E5.7. Hop. To move with light bounding skips or leaps. In the specific case of a trailer, to develop a vertical oscillation such that one or more wheels intermittently loses contact with the surface being traversed.

E5.8. Preferred prime mover. Each model of Army standard tactical trailer has been designed and tested for acceptable performance when towed by a specific model or family of Army standard tactical truck. The preferred prime movers for Army standard 2 – wheel tactical trailers are specified in MIL-DTL-45150.

**E6. NOTES**

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

E6.1. The performance requirements in this appendix were extracted and adapted in part from SAE AS8090, “Mobility, Towed Aerospace Ground Equipment, General requirements for,” (formerly MIL-M-8090). The requirements extracted from SAE AS8090 were those addressing mobility Type V, “Mobile on highways and unimproved cross-country terrain.” Performance requirements were also extracted as applicable from MIL-DTL-45150, “Chassis, Trailer, 2-Wheel Cart Type ¼ to 3-1/2 Ton.”

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APPENDIX F

PERFORMANCE REQUIREMENTS FOR  
CONTAINER, TACTICAL, NON-EXPANDABLE, WITH PROVISIONS FOR INTEGRAL  
ENVIRONMENTAL CONTROL UNIT AND GENERATOR SET



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**F1. SCOPE.**

F1.1 Scope. This appendix established specific requirements for a nonexpendable, rigid wall, relocatable container meeting the dimensional and stacking strength requirements of International Organization for Standardization (ISO) Type 1C Cargo Containers for purposes of transport. Nominal dimensions are: height 8 ft, width 8 ft, and length 20 ft (2.4 by 2.4 by 6.1 m). It is a derivative of the Army Standard "Shelter, Tactical, Non-Expandable, 100 Amp." In addition to the general cargo area, the container is provided with integral compartment(s) and wiring for a 10 KW electrical generator and an Environmental Control Unit (ECU). This appendix is a mandatory part of this specification. The information contained herein is intended for compliance, predicated on the SKO being incorporated in a container other than a standard tactical shelter.

F1.2 Measurement system. The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information only. (Reference ASTM SI 10)

**F2. APPLICABLE DOCUMENTS**

F2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification appendix. This section does not include documents recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this appendix, whether or not they are listed.

F2.2 Government documents.

F2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see paragraph 6.2).

**SPECIFICATIONS**

**FEDERAL**

A-A-59486A	- Padlock Set
A-A-50271	- Plate, Identification
A-A-55804	- Rods, Ground (with attachments)
A-A-59559	- Post, Binding, Electrical, Waterproof (Insulated), Dual O-ring Seal

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**MILITARY**

MIL-C-22992	- Connectors, Plugs, and Receptacles, Electrical, Waterproof, Quick disconnect, Heavy Duty Type, General specification for
MIL-T-27260	- Tie Down, Cargo, Aircraft, CGU-1/B
MIL-P-27443	- Pallets, Cargo, Aircraft, Type HCU-6/E, HCU-12/E, and HCU-10/C
MS14055	- Insert Arrangements, Electrical Connector, Size 44, Class L, 60 Amps
MS90558	- Connector, Receptacle, Electrical, Wall Mounting (with Coupling Ring) Class L (Equipment Receptacle)
MS90564	- Cover, Electrical Connector, Plug, Class L

**STANDARDS**

**FEDERAL**

FED-STD-595	- Colors Used in Government Procurement
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**DEPARTMENT OF DEFENSE**

MIL-STD-129	- Standard Practice for Military Marking
MIL-STD-171	- Finishing of Wood and Metal Surfaces
MIL-STD-209	- Interface Standard for Lifting and Tie-down Provisions
MIL-STD-810	- Environmental Test Methods and Engineering Guidelines
MIL-STD-913	- Requirements for the Certification of Sling Loaded Military Equipment for External Transportation by Department of Defense

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MIL-STD-1472                      Helicopters  
   - Department of Defense Design Criteria  
   Standard, Human Engineering

**HANDBOOKS**

MIL-HDBK-784                      - Guidelines – Design to Minimize  
   Contamination and to Facilitate Decontamination  
   of Military Vehicles and Other Equipment:  
   Interiors and Exteriors  
MIL-HDBK-1791                      - Designing for Internal Aerial Delivery in  
   Fixed Wing Aircraft

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094).

F2.2.2 Other Government documents, drawings and publications. The following other Government documents, drawings, and publications form a part of this document to extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

**DRAWINGS**

5-4-6865                              - Shelter, Assembly, Non-Expandable-100 Amp

**TECHNICAL MANUALS**

TM 9-4120-425-14&P                      - Operator's, Unit, Direct Support and General  
   Support Maintenance Manual Including Repair  
   Parts and Special Tools List for Air Conditioner,  
   Horizontal, Compact, 36,000 BTU/Hr, 208 Volt,  
   Three Phase, 50/50 Hz, Part No. S9500-36KH-1,  
   NSN 4120-01-467-2638  
TM 9-6115-642-10                      - Operator's Manual, Generator Set, Skid  
   Mounted, Tactical Quiet, 10 KW, 60 and 400 Hz,  
   MEP-803A (60 Hz) 6115-01-275-5061, MEP-813A  
   (400 Hz) 6115-01-274-7392  
TM 10-5411-202-24P                      - Organizational, Direct Support and  
   General Support Maintenance Repair Parts and

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Special Tools List for Shelter, Tactical, Non-Expandable

Copies of drawings and Technical Manuals are available from the U.S. Army Natick Research, Development, and Engineering Center, Attn: SSCNC-WST, Natick, MA 07160–5018.

**F2.3 Non-Government publications.** The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents that are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see paragraph 6.2)

**AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)**

ANSI Z535.4 - Product Safety Signs and Labels

(Application for copies should be addressed to the American National Standards Institute, 11 W. 42<sup>nd</sup> Street, New York, New York 10036.)

**ASSOCIATION OF AMERICAN RAILROADS**

Rules Governing the Loading of Department of Defense Materiel on Open Top Cars

(Application for copies should be addressed to the Publications Department, Association of American Railroads, Transportation Technology Center, Inc., PO Box 79780, Baltimore MD 21279-0780, 877-999-8824 (toll free), email: pubs@aar.com).

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM E 1925 - Specification for Engineering and Design  
Criteria for Rigid Wall Relocatable Structures

ASTM E 1976 - Specification for Shelter, Tactical,  
Nonexpandable

ASTM SI 10 - Standard for Use of the  
International System of Units (SI): The Modern  
Metric System

(Application for copies should be addressed to the American Society for Testing and Materials,

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100 Barr Harbor Drive, West Conshohocken, Pa 19428-2959.)

INTERNATIONAL STANDARDS ORGANIZATION (ISO)

ISO 668	- Series 1 freight containers – Classification, dimensions and ratings
ISO 830	- Freight Containers - Vocabulary
ISO 1161	- Series 1 freight containers - Corner Fittings - Specification
ISO 1496-1	- Series 1 freight containers - Specification and testing - Part I: General cargo containers for general purposes

(Application for copies should be addressed to the American National Standards Institute, 11 W. 42<sup>nd</sup> Street, New York, New York 10036.)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

NEMA WD 6	- Wiring Devices – Dimensional Specifications
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(Application for copies should be addressed to the National electrical Manufacturers Association, 1300 North 17<sup>th</sup> Street, Rosslyn, VA 22209.)

F2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### F3. REQUIREMENTS

F3.1 First article. When specified, a sample shall be subjected to first article inspection in accordance with paragraph F4.2.1.

F3.2 Definitions. Terminology related to freight containers used in this specification is defined in ISO 830.

F3.3 Design. The container shall be designed and built to withstand a variety of environments while providing an effective and reliable facility for storage, transport, and operation of installed equipment.

F3.3.1 Standardization. The requirements specified herein are intended to promote standardization of rigid wall relocatable containers. Existing commercial and (where necessary)

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military performance and test criteria have been used to the maximum extent possible. A Technical Data Package consisting of Army Drawing 5-4-6865 and its subordinate drawings and specifications is cited for reference. Subject to the performance requirements specified herein, the container design shall incorporate to the maximum extent practicable shelter parts already established in the Army supply system. Such parts are listed in TM 10-5411-202-24P with National Stock Numbers (NSNs).

F3.3.2 Simplicity. The contractor shall provide the simplest design consistent with performance requirements. The design shall also be directed toward minimizing the physical exertion, man-hours, tools, and other equipment required to prepare the container for operation and for transport.

F3.3.3 Weight. To provide the greatest mobility for military forces, the contractor shall construct the container of materials with high strength-to-weight ratios. The current Army TDP for non-expandable shelters requires the use of aluminum alloy frame members and panels fabricated of aluminum alloy skins that are bonded to a non-metallic honeycomb core and sealed to a welded frame of square aluminum alloy tubing. The contractor shall provide containers constructed of materials that meet the requirements of this document and provide performance equal to or better than the materials of the current shelter design with equal or less weight per unit volume.

F3.4 Performance. The container shall meet all requirements specified herein. As a special-purpose tactical container, the specifications are an amalgam of requirements and modified requirements from referenced ASTM, ANSI, ISO, and Military Standards. Where feasible, these requirements have been incorporated in the text of this specification either verbatim, or with modifications consistent with the intended use of the item.

F3.4.1 Physical security. The container shall be lockable and provide physical security for all internally stored or mounted equipment and supplies sufficient to discourage tampering, unauthorized use, and theft.

F3.4.1.1 Locks. Locking of the container shall be accomplished with padlocks. The hasps and staples or other locking devices incorporated in the container shall accept key-operated, tumbler-type padlocks conforming to CID A-A-1927, Type I, Size B, which have shackles with a diameter of  $0.343 \pm 0.040$  inch.

F3.4.1.2 Anti-tampering measures. When the container is prepared for transport and storage, the padlock(s) shall be plainly visible on the container exterior. It shall not be possible to use or remove any of the components stored in the container without either removing the locks or visibly damaging the container.

F3.4.1.3 Loss and damage prevention. All doors, panels, and other covers for openings in the container shall be permanently affixed to the container.

F3.4.1.3.1 Door static load. Vertically hinged doors shall be capable of supporting a 200 lb (90 kg) downward load on the edge opposite the hinge without sustaining damage. (Reference ASTM E 1925)

F3.4.1.3.2 Wind gust load. All doors, panels, and other covers for openings in the container shall

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be provided with latches, stays, or other mechanisms that hold them in the open position and prevent them from damage when subjected to wind gusts up to 60 mph (100 km/h). (Reference ASTM E 1925)

F3.4.2 Electrical outlets. Branch circuits and power outlets for electrical equipment shall be provided both inside and outside the container. In addition to circuits for the ECU and air compressor, the interior lights, and the exterior lights, the container shall be provided with at least three 125 volt, 20 Ampere circuits for electrical receptacles. The two interior circuits shall have at least four duplex 5-15R receptacles as defined by NEMA WD 6 placed at regular intervals at least five feet above the container floor, one circuit for each side of the container. The third circuit shall provide at least one duplex 5-15R receptacle with weather-tight cover on each corner (left side and right side of both front and rear) of the container exterior. One 208 volt 3-phase receptacle with weather-tight cover for the air compressor shall be located on each side of the container exterior near the generator.

F3.4.3 Lighting. The container shall provide permanently mounted 110 volt AC interior lighting. The lighting system shall provide switch-selectable white light and Night Vision Device (NVD) safe light (i.e. blue-green light not detectable to NVDs). Two 500 Watt lights on telescoping stands shall be provided as BII with each container for exterior lighting.

F3.4.4 Erecting and striking. Erecting and striking the container shall be accomplished within two man-hours. The container shall be provided with screw jacks or other leveling devices that enable the container to sit level on surfaces having up to a 24 in. (610 mm) differential in grade to the diagonal dimension of the container floor. (Reference ASTM E 1925)

F3.4.5 Workmanship.

F3.4.5.1 Panel Flatness. Panel surfaces shall not be cupped or bowed in excess of 0.125 in (3 mm) over any 48 in (1300 mm) distance. (Reference ASTM E 1925)

F3.4.5.2 Panel bonding. If the container floor, roof, wall, or end panels are of laminated construction, they shall be free of delaminations. (Reference ASTM E 1925)

F3.4.6 Transportability. The fully-loaded container shall be suitable for commercial and military shipment via aircraft, ship, railcar, and truck. When configured for transport the containers shall meet the requirements for ISO freight containers as specified herein.

F3.4.6.1 Safety certification. The contractor shall ensure that all containers presented for acceptance by the Government have been certified safe by the Coast Guard or other authorized Approval Authority as required by Code of Federal Regulations (CFR) 49, Parts 450 through 453, and shall provide a copy of the certification paperwork. (Reference ASTM E 1976)

F3.4.6.2 Overall dimensions. The overall exterior dimensions of the containers shall conform to those of ISO 668 general-purpose freight containers designated 1C, as shown in Table F1, or 1CX, which may be less than 8 feet tall. No part of the container, including padlocks, shall extend beyond the planes defined by the outer surfaces of the corner fittings. (Reference ASTM E 1925)

F3.4.6.3 Tare mass. The mass (weight) of the empty container as delivered shall not exceed

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4,500 pounds.

F3.4.6.4 Gross mass rating. The container shall be designed for a maximum combined mass (weight) of container and cargo of at least 15,000 lbs. (Reference ASTM E 1976)

F3.4.6.5 Corner fittings. The containers shall be equipped with corner fittings in accordance with the dimensional requirements for corner fittings as stipulated in ISO 1161 (See Figures F-6 through F-9). Dimensions and tolerances between corner fittings shall be in accordance with ISO 668 (See Figure F-10). The upper faces of the top corner fittings shall protrude above the top of the rest of the container by minimum of ¼” (6 mm). The lower faces of the bottom corner fittings shall protrude below the bottom of the container by a minimum of 7/16” (11 mm). (Reference ISO 1496-1)

Type	Height		Width		Length	
	ft. in.	Tol. in.	ft. in.	Tol. in.	ft. in.	Tol. in.
1C	8 0	+0 -0.1875 (2438 mm) (+0 -5 mm)	8 0	+0 -0.1875 (2438 mm) (+0 -5 mm)	19 10.5	+0 -0.25 (6058 mm) (+0 -6 mm)

Table F1. Container Overall Dimensions

F3.4.7 Air transport. The container shall be suitable for transport by the U.S. Air Force C130 and larger cargo aircraft and for external airlift by helicopter.

F3.4.7.1 Cargo aircraft.

F3.4.7.1.1 Decompression vent. The containers shall be capable of withstanding an internal pressure differential of 8.3 psi (0.57bar) developed within 0.5 sec or less without any part of the container becoming a missile. For this purpose, the container shall be provided with a minimum total vent area of 24 in<sup>2</sup> (154.8 cm<sup>2</sup>). Each vent shall be adequately protected from cargo load shift to ensure that the required vent area is available during rapid decompression of an aircraft. (Reference ASTM E 1925)

F3.4.7.1.2 Flight maneuver forces. The containers shall be capable of being restrained against and withstanding forces imposed by aircraft flight and maneuvering operations. For aircraft transport, the standard 20-foot ISO freight containers are each placed on three HCU-6/E pallets (See MIL-P-27443 for description) connected end-to-end by 2-inch-wide couplers. When latched to the 463L cargo system rails in military aircraft, the pallets are rated under the criteria of MIL-HDBK-1791 to restrain cargo loads of up to 10,000 lbs each, for a total rated load of 30,000 lbs. The perimeter of the combined pallets will provide 42 cargo tie-down rings, each rated at 7,500 lbs in any direction. The contractor shall provide a recommended tie-down pattern for fastening the containers to the pallet tie-down rings with CGU-1/B tie down devices (See MIL-T-27260 for description), which have a rated capacity of 5,000 lbs each; or an alternate method for interfacing the container with the 463L cargo system rails. When attached to the 463L cargo system rails using the contractor’s recommended method, the containers, loaded to



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their rated gross weight with all cargo tied down to the container floor and the generator and ECU installed, shall remain attached to the 463L rails or on the pallets (if used), and shall have the mechanical strength to meet the following criteria (Reference MIL-HDBK-1791):

a. Containers shall be capable of withstanding, without loss of serviceability, static forces equal to the dynamic forces imparted by the following accelerations, applied independently (1.0 G is the acceleration due to gravity; all directions are relative to the aircraft.):

<u>Direction</u>	<u>Load Factor</u>	<u>Equivalent Static Load</u>
Up	2.0 G	30,000 lbs
Down	4.5 G	67,500 lbs

b. Containers shall be capable withstanding, without loss of structural integrity, static forces equal to the dynamic forces imparted by the following accelerations, applied independently:

<u>Direction</u>	<u>Load Factor</u>	<u>Equivalent Static Load</u>
Forward	3.0 G	45,000 lbs.
Aft	3.0 G	45,000 lbs
Lateral	1.5 G	22,500 lbs

c. The equipment shall also be able to withstand the following independently applied changes in velocity ( $\Delta V$ ) of the aircraft floor within 0.1 second without loss of serviceability. (The final velocity must be held long enough for an adequate cargo response to the input.)

<u>Direction</u>	<u><math>\Delta V</math></u>
Up	10.0 ft/sec
Down	11.5 ft/sec

d. Containers shall be capable of withstanding the following the following independently applied changes in velocity ( $\Delta V$ ) of the aircraft floor within 0.1 sec without loss of structural integrity. (The final velocity must be held long enough for an adequate cargo response to the input.)

<u>Direction</u>	<u><math>\Delta V</math></u>
Forward	10.0 ft/sec
Aft	5.0 ft/sec
Lateral	5.0 ft/sec

F3.4.7.2 Transport provision identification. The container lifting provisions, tie down provisions, and center of balance shall be identified and labeled in accordance with MIL-STD-129.

F3.4.7.3 Helicopter external lift. The fully loaded container, with generator and ECU installed, shall be certified suitable for External Air Transport (EAT) (sling load) by CH-47 and larger cargo helicopters in accordance with MIL-STD-913.

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**F3.4.8 Marine transport.**

**F3.4.8.1 Base strength.** When loaded to their gross weight rating and subjected to dynamic vertical accelerations of up to 1.8 G, the containers shall be capable of being supported by their bottom corner fittings only, without suffering permanent deformation or other damage. Downward deflection of the base shall not exceed 0.75 in (19 mm) under these conditions. (Reference ISO 1496-1)

**F3.4.8.2 Stacking capability.** The fully-loaded containers shall be capable of supporting a superimposed mass equal to five fully-loaded standard ISO 668 1C freight containers (GW 52,900 lbs (23,995 kg) each), taking into account conditions aboard ships at sea which can impose vertical accelerations of up to 1.8g, and the relative eccentricities between superimposed containers of up to 1 in. (2.5 mm) laterally and up to 1.5 in. (3.8 mm) longitudinally. (Reference ISO 1496-1)

**F3.4.8.3 Panel strength.** In addition to their contribution to the overall strength of the container, the panels used as structural members of the container shall meet the following requirements.

**F3.4.8.3.1 Side walls.** Each side wall of the container shall be capable of withstanding a uniformly distributed internal load of 5820 lb (2640 kg) applied separately and arranged to allow free deflection of the wall, without suffering structural damage or loss of serviceability. (Reference ASTM E 1976)

**F3.4.8.3.2 End walls.** Each end wall of the container shall be capable of withstanding a uniformly distributed internal load of 3880 lb (1760 kg) applied separately and arranged to allow free deflection of the wall, without suffering structural damage or loss of serviceability. (Reference ASTM E 1976)

**F3.4.8.4 Transverse rigidity.** The container end structures (end frames in combination with their end walls) shall be sufficiently rigid to withstand the transverse racking forces resulting from ship movement without sustaining permanent deformation or other damage that renders the container unsuitable for use. The container end structures shall be capable of withstanding tension and compression forces of 33,700 lbs (150 kN) applied against each upper corner fitting with the container restrained by anchor devices acting through the bottom apertures of the lower corner fittings. The forces shall be applied along a vector parallel to both the container base and the plane of the end frame. The end frame shall be restrained in such a manner that the lower corner fitting directly beneath the applied force is restrained from vertical movement and the other corner fitting, diagonally opposite the applied force on that end, is restrained from lateral movement. The sideways deflection of the top of the container end frame with respect to the bottom of the container end frame at the times it is subjected to the full transverse force shall not cause the sum of the changes in the length of the diagonals to exceed 2.36 in (60 mm). (Reference ISO 1496-1)

**F3.4.8.5 Longitudinal rigidity.** The container side structures (top and bottom side rails in combination with their side wall and corner structures) shall be sufficiently rigid to withstand the longitudinal racking forces resulting from ship movement without sustaining permanent deformation or other damage that renders the container unsuitable for use. The container side

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structures shall be capable of withstanding tension and compression forces of 16,850 lbs (75 kN) applied against each upper corner fitting with the container restrained by anchor devices acting through the bottom apertures of the lower corner fittings. The forces shall be applied along a vector parallel to both the container base and the plane of the side structure. The side structure shall be restrained in such a manner that the lower corner fitting directly beneath the applied force is restrained from vertical movement and the other corner fitting, diagonally opposite the applied force on that side, is restrained from lateral movement. The sideways deflection of the top of the container side with respect to the bottom of the container side at the times it is subjected to the full transverse force shall not cause the sum of the changes in the length of the diagonals to exceed 1.0 in (25 mm). (Reference ISO 1496-1)

F3.4.9 Rail transport. In rail transport mode the fully-loaded container with generator and ECU installed shall withstand without loss of serviceability the shock and vibration imparted by coupling rail cars at impact speeds up to 8 miles per hour (mph), both when mounted on rail cars with ISO corner locks and on standard flatcars.

F3.4.9.1 ISO lock rail car restraint capability. The container, with the generator and ECU installed, and a uniformly distributed payload anchored to the cargo floor such that the gross weight equals 15,000 lbs (6875 kg), and solidly anchored on one end through the bottom apertures of the lower corner blocks, shall withstand a force of 30,000 lbs equally divided and applied horizontally to the container through the bottom apertures of the lower corner fittings on the other end, both towards and away from the anchor points, without suffering structural damage or loss of serviceability. (Reference ISO 1496-1)

F3.4.9.2 Standard flatcars restraint capability. The contractor shall provide a recommended method for restraining the containers to flatcars in accordance with the standard loading methods shown in Section No. 6 of the “Rules Governing the Loading of Department of Defense Materiel on Open Top Cars,” that will enable the container to withstand the shock and vibration imparted by coupling rail cars at impact speeds up to 8 mph (13 kph). (Reference MIL-STD-810)

F3.4.10 Motor vehicle transport.

F3.4.10.1 Load transfer area. The container bases shall have end transverse members and intermediate transverse members or other support of sufficient strength to permit vertical transfer of the containers’ rated gross load to or from the longitudinal members of a carrying vehicle that lacks ISO corner locks. Such longitudinal members are assumed to lie within the two 10 in. (25 mm) wide zones defined by the broken lines in Figure F-1. (Reference ISO 1496-1)

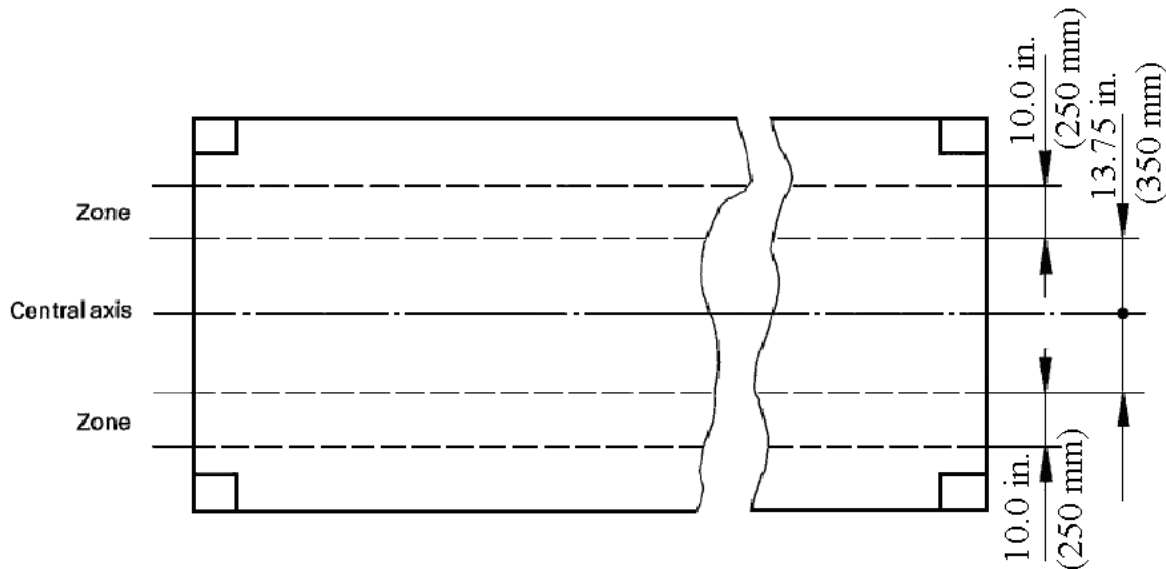


Figure F-1. Load Transfer Zones, ISO 1496-1

F3.4.10.2 Tactical vehicle transport. When fully loaded the container shall have the durability to withstand being transported by truck, trailer, or dolly over a variety of surfaces including 30% on primary roads, 65% on secondary roads, and 5% on open cross-country. The surfaces traversed shall include various states of disrepair that may be encountered worldwide, including bumps, cobblestone, and washboard. During or following the travel, there shall be no damage to, or displacement of, any component, accessory, part, or other item installed in or on the container and no evidence of damage to the container. Maximum safe speed for the surface and conditions shall be maintained; not to exceed 55 mph (89 kph) on primary roads, 45 mph (72 kph) on secondary roads, and 15 mph (24 kph) for travel cross-country.

#### F3.4.11 Transport handling.

F3.4.11.1 Drop. The container, with a uniformly distributed payload anchored to the floor such that the gross weight equals 15,000 lb (6875 kg), shall withstand flat and rotational drops of 6 in. (150mm) onto a level concrete surface without structural damage or loss of serviceability. (Reference ASTM E 1925)

#### F3.4.11.2 Overhead lift.

F3.4.11.2.1 Upper fittings. The container, with the generator and ECU installed and a uniformly distributed payload anchored to the cargo floor such that the gross weight equals 48,000 lb (22,000 kg) (3.2 G by 15,000 lbs (6875 kg)), shall withstand overhead lift by a four-cable sling attached to its top corner fittings without suffering structural damage or loss of serviceability. NOTE: This requirement supersedes the normal criteria for overhead lift by crane using the top corner fittings. (Reference ASTM E 1925)

F3.4.11.2.2 Lower fittings. The container, with the generator and ECU installed and a uniformly distributed payload placed on the cargo floor such that the gross weight equals 48,000 lb (22,000 kg) (3.2 G by 15,000 lbs (6875 kg)), shall withstand overhead lift by a four-cable sling attached

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to its bottom corner fittings without suffering structural damage or loss of serviceability. (Reference ASTM E 1925)

F3.4.11.3 Fork lift pockets. Fork lift pockets shall be provided for handling containers in the loaded condition (outer pockets). The fork lift pockets shall meet the dimensional requirements specified in Figure F-11 and shall pass completely through the base structure of the container so that lifting devices may be inserted from either side. (Reference ASTM 1976 and ISO 1496-1). The container, with the generator and ECU installed and a uniformly distributed payload anchored to the cargo floor such that the gross weight equals 24,000 lb (11,000 kg) (1.6 G by 15,000 lbs (6875 kg)), shall withstand overhead lift by two horizontal bars, each centered in one of the outer fork lift pockets and projecting 72 in (1.83 m) into its pocket as measured from the outside face of the container, without suffering structural damage or loss of serviceability. (Reference ISO 1496-1)

F3.4.11.4 Impact resistance. All floor and roof panels shall be capable of withstanding blows equivalent to those imparted by a 70 lb (30 kg) steel cylinder 3 in. (80 mm) in diameter with a hemispherical end, dropped from a height of 30 in. (800 mm). All other panels shall be capable of withstanding blows equal to those imparted by the same steel cylinder dropped from a height of 16 in. (410 mm). Impact shall not result in any of the following: rupture of the skin on either side; delamination of impacted skin from the core or crushing or collapsing of the core outside a 3.12 in. (90 mm) radius from the center of impact; core shear failure outside a five inch radius from the center of impact; or any delamination of the opposite skin from the core. (Reference ASTM E 1925)

F3.4.11.5 Floor loading capability. The container floor shall be rated to support a uniform load of 80 lb/ft<sup>2</sup> (390 kg/m<sup>2</sup>). The container floor shall also be rated to support a concentrated loads of 2,000 lb (910 kg) over a 4 ft<sup>2</sup> (0.4 m<sup>2</sup>) area at the center of the floor, and to support point loads of 125 lb/in<sup>2</sup> (57 kg/650 mm<sup>2</sup>). The loads shall not cause any permanent deformation of the floors or any deflection that interferes with operation of the container under any of the operational or transport conditions specified herein. (Reference ASTM E 1925)

F3.4.11.6 Roof loading capability. The roof shall withstand a snow load of 40 lb/ft<sup>2</sup> (200 kg/m<sup>2</sup>) and a personnel load of 660 lb (300 kg) static over 2 ft<sup>2</sup> (0.2 m<sup>2</sup>). (Reference ASTM E 1925)

### F3.5 Inputs and interfaces.

#### F3.5.1 Electrical power.

F3.5.1.1 External power. The container shall be provided with an externally accessible power input connector capable of accepting 208 volt, 3-phase, 60 Hz AC power via an Army power cable assembly. The cable requires a mating 100 Amp receptacle consisting of: a wall-mounting receptacle with coupling ring conforming to MIL-C-22992, Class L, Style P comprised of a MS90558 C 44 4 shell, with an MS14055 insert having insert arrangement 44-12, along with a MS90564 44 C weather-tight cover. The container shall be supplied with a service box with a capacity of at least 100 amps.

F3.5.1.2 Internal power. The container shall incorporate provisions for permanently mounting a generator in the front end of the container (opposite the personnel door) and connecting it to the

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container electrical system. The generator will consist of an Army Standard Skid-mounted Diesel-Engine-Driven 10 kW 60 Hz Tactically Quiet Generator Set, Model MEP-803A. The MEP-803A is 62" long by 32" in wide by 37" in high (1575 mm x 813 mm x 940 mm), and weighs 1,182 lbs (536 kg). All mechanical and electrical interfaces for mounting and operating the unit shall be provided. A door, panel, or other cover(s) for the generator shall be provided to assure container meets all battlefield survivability requirements with the generator installed (see F3.6.2 through F3.6.2.3). The design may incorporate slides, a roller tray, or similar measures as needed to extend the generator from inside the container for operation and/or maintenance (Reference TM 9-6115-642-10), and retract the generator inside the container walls for storage, transport, and NBC survivability. To facilitate operation and maintenance of the generator while the container is mounted on a PLS pallet, the generator shall be accessible through the container side wall(s) rather than the end wall. The generator will be supplied by the Government, and shall be installed by the contractor.

F3.5.2 Human interface. The container shall be suitable for setup, operation, and maintenance by the majority of U.S. Army personnel, from the fifth percentile female to the ninety-fifth percentile male. Basic U.S. Army anthropometrics charts and applicable DOD human engineering guidelines are provided in Appendix D. (For further information the contractor may refer to MIL-STD-1472)

F3.5.2.1 Protective clothing. The container shall be operable and maintainable by personnel wearing heavy gloves and clothing suitable for cold weather (also see paragraph F3.6.2.3).

F3.5.2.2 Illumination level. The container visible spectrum interior lights shall provide general task illumination of at least 50 foot-candles (540 Lux), measured at thirty inches above the container floor. Light shall be so distributed as to minimize glare and specular reflection. The interior surfaces of the container walls and ceiling shall approximate Semi-Gloss Green 24533 or Semi-Gloss White 27875 of FED-STD-595, and the floor shall approximate Lusterless Gray 36118.

F3.5.2.3 Door opening. To provide for ease of entrance and egress while moving or carrying heavy, bulky items, the container shall have at least one personnel door that is at least 76 in (1930 mm) high and 48 in (1220 mm) wide. (Reference ASTM E 1925)

F3.5.3 Plates and labels. All identification, warning, and instruction plates and labels shall be permanently affixed to the container. They shall be resistant to deterioration caused by heat, cold, solar radiation, water, and petroleum products to the extent that they will remain intact and readily legible for the expected economic life of the container. Marking shall be accomplished in a manner that does not adversely affect the life and utility of the container. All plates and labels shall be printed in the English language, and may be supplemented by graphical symbols. (Reference MIL-STD-129)

F3.5.3.1 Hazard identification. Unguarded physical hazards (see paragraph F3.7.1) shall be identified. Product safety signs and labels shall conform to ANSI Z535.4.

F3.5.4 Communications. The container shall be provided with a general-purpose tactical communications signal entry panel (SEP) allowing data and voice connections for Global

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Combat Support System – Army (GCSS-A). The panel exterior shall provide telephonic connectors consisting of: Two A-A-59559 Type I binding posts, and two A-A-59559 Type II binding posts. It shall also provide LAN connectors consisting of: one female Bayonet Neill Concelman (BNC) connector for RG-58 coaxial cable (for 10Base2 Thinnet); one RS-232 female DB9 connector for serial communications; and two FCC RJ-45 plugs (for telephone, 10BaseT and 100BaseTX fast Ethernet). The DB9 plugs shall be provided with weather-tight covers capable of maintaining a weather-tight seal with or without a cable attached to the plug. The connectors shall be wired to pass signals through the wall to like connectors on an interior panel (i.e. post-to-post, plug-to-plug, female BNC-to-female BNC), using standard pin assignments.

**F3.6 Environment.**

**F3.6.1 Environmental protection.** The container must provide containment measures for coolant, fuel, petroleum, oils, and lubricants in the mounting provisions for the generator.

**F3.6.2 Survivability.** The container must be survivable in the battlefield environment.

**F3.6.2.1 Protective coloration.** For concealment, the exterior of the container must be provided with a color scheme that will blend in with the operational environment. Camouflage patterns must be supplied by the Army, and cannot be made available for new designs before the First Article has been approved. Unless and until otherwise specified by the contract, the exterior of the container shall be a tan approximating color chip 33446 of FED-STD-595.

**F3.6.2.2 Blackout conditions.** While in its operational configuration with the personnel entryway(s) closed, the container shall be light tight. None of the light generated when the interior lights of the container are illuminated shall be visible from any point outside the container. The personnel entryway(s) shall be provided with an interlock that opens the electrical circuit(s) for the interior lights so that the white lights are completely extinguished and replaced with NVD-safe lighting before the light-tight seal of the entryway is broken. The interlock feature shall be provided with a switch or other mechanism permitting it to be deactivated when not needed.

**F3.6.2.3 Nuclear, Biological, and Chemical Contamination Survivability.** The exterior of the container shall be nuclear, biological and chemical (NBC) contamination survivable. It shall be decontaminable to negligible risk levels using standard Army decontamination procedures through five contamination/decontamination cycles without loss of seal integrity or replacement of the Chemical Agent Resistant Coating (CARC, see paragraph 3.10.5). The container interior need not be NBC contamination survivable. (This is a military-unique requirement.)

a) The presence of open seams, crevices, grooves, cavities, hinges, and other catch points in the container exterior shall be minimized to the extent practical.

b) In both its operational and transport configurations, the container design shall provide ready means for one person to close all vents, drains, and other openings and render the container vapor-tight within fifteen minutes without the use of tools.

c) The materials used in construction of the container shall not absorb biological or chemical agents, and shall not be damaged by the steam, solvents, and strong bleaching agents used for decontamination.

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- d) If suitable non-absorbent materials for caulk, gaskets, seals, and other necessary elastomers are impractical, uneconomical, or unavailable, the elastomers shall be installed in a form designed for easy removal and replacement as part of the decontamination procedure.
- e) Electrical components (switches, light fixtures, junction boxes, outlets, conduit, etc.) shall be of the sealed, weather-tight variety.
- f) Although the container is not intended for operation in a contaminated environment, circumstances may require use of contaminated equipment until replacements can be obtained; therefore the container must be operable and maintainable by personnel in MOPP IV gear.
- g) For DOD guidelines on designing to minimize contamination and to facilitate decontamination of military vehicles and other equipment, the contractor may refer to MIL-HDBK-784.

**F3.6.3 Operational environment.** The container shall operate in climatic design types hot, basic, and cold as defined by MIL-STD-810. It must be operable under all adverse weather conditions of these climatic design types.

**F3.6.3.1 Operating temperatures.** The container shall be operable when conditioned to air temperatures from -25 °F to +120 °F (-31 °C to 49 °C) inclusive.

**F3.6.3.2 Differential temperature.** The container roof, floor, and side and end panels shall be capable of withstanding the effects of interior-to-exterior temperature differentials created by the ECU throughout the operating temperature range of the container, including the effects of direct solar heating as well as the ambient external air temperature. The maximum expected differential would occur on the roof panel, which in hot climates may attain an exterior skin temperature of 205 °F (96 °C) while the container interior is maintained at 85 °F (29 °C) by the ECU. The panels shall sustain the temperature differential without delaminating or permanently deforming. (Reference ASTM 1925)

**F3.6.4 Storage environment.** The container shall withstand outdoor storage in climatic design types hot, basic, and cold as defined by MIL-STD-810 without sustaining damage. The container will be stored with all panels and doors closed. The container shall withstand storage in all air temperatures from -50 °F to +160 °F (-46 °C to 71 °C), inclusive.

**F3.6.5 Weathertightness.** With doors closed in the operational mode and doors and panels closed in the transport mode, the container shall be watertight without the need for additional external sealing, calking, taping, etc. Weather seals shall be designed to be an integral part of the container, and to be readily replaced by the user in the field without the use of special tools. (Reference ASTM 1925)

**F3.6.6 Interior environment.** The container shall incorporate provisions for permanently mounting an ECU. The ECU will consist of an Army Standard Compact Horizontal Air Conditioner, 9,000 BTU/hr, 208 Volt, 3-phase, 60 Hz. The ECU is 26" long by 23-3/4" wide by 16" high (660 mm x 603 mm x 406 mm), and weighs 200 lbs (91 kg). All mechanical and electrical interfaces for mounting and operating the unit shall be provided. A door, panel, or other required cover(s) for the ECU shall be provided to assure container meets all battlefield



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survivability requirements with the environmental control unit installed (see F3.6.2 through F3.6.2.3). The design may incorporate slides, a roller tray or similar measures as needed to extend the ECU from the container for operation and/or maintenance (Reference TM 5-4120-386-14), and retract the ECU inside the container walls for storage, transport, and NBC survivability. The ECU will be supplied by the Government and shall be installed by the contractor.

F3.6.7 Heat transfer. The container shall have an overall heat transfer coefficient less than or equal to 0.35 Btu/(h(ft<sup>2</sup>)(°F)) (2.2W/(m<sup>2</sup>(°K))). (Reference ASTM 1925)

F3.6.8 Fungus and moisture. The container electrical circuits and other integral parts shall be composed of inherently fungus and moisture resistant materials, or shall be protected from fungus and moisture damage by protective coating(s) or hermetic seal(s). All gaskets, electric cable covers and other elastomer parts that are exposed to air shall be fungus resistant.

F3.6.9 Ozone. All gaskets, electric cable covers and other elastomer parts exposed to air shall be ozone resistant.

F3.6.10 Marine environment. The container shall be resistant to a salt fog environment. There shall be no evidence of corrosion or degradation to any part of the container (including fasteners, jacks, and seals) after two cycles of 24 hours of salt fog exposure followed by 24 hours of drying.

F3.6.11 Desert environment. The external moving parts of the container shall be designed to resist the effects of blowing sand.

F3.7 Safety. The container, with and without the generator and ECU installed, shall not present any uncontrolled safety or health hazards throughout the life cycle of the system. The container shall incorporate the following features to assure safe operation.

F3.7.1 Physical hazard control. Mechanical guards, electrical insulation, thermal insulation, and other safety devices shall be provided to protect operators and maintenance personnel from inadvertent contact with electrically energized parts, high temperature surfaces, and other physical hazards (see Appendix D). The safety devices shall not interfere with operation of the container. Exposed sharp corners and sharp edges on container parts shall be eliminated if they serve no functional purpose. Hazards that cannot be eliminated, cannot be controlled by equipment placement, and cannot be controlled by protective devices shall be identified to the user by printed warnings or cautions.

F3.7.2 Physical strain control. The physical exertion required to set up the container for operation in the field and to prepare it for ground transport shall not exceed safe limits for the target population.

F3.7.3 Electrical ground. All electrical circuits incorporated in the container shall be electrically grounded to the container frame and to the power source ground through the electrical input cable. All electrical power outlets shall be provided with Ground Fault Circuit Interruption (GFCI) protection. A ¼-inch diameter grounding stud and captive wing nut shall be provided on the container exterior in a clearly marked location. When the container is set up for operation,

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the grounding stud location shall permit it to be connected to an earth ground with a grounding wire not more than six feet long. A grounding rod conforming to Commercial Item Description A-A-55804, Type III, Class B, along with a slide hammer for ground rod installation shall be provided as Basic Issue Items (BIIs) with each container. There shall be a dedicated storage location for the grounding rod and slide hammer inside the container.

F3.7.4 Steps. To provide access to the container roof for helicopter sling load operations, folding steps or other means of safe access to the roof shall be provided.

F3.7.5 Tread surfaces. The container floor, steps, and other walking or standing surfaces, including the container roof, shall be provided with non-slip surfaces.

F3.7.6 Anti-Entrapment Measures. The container shall be provided with anti-entrapment measures to prevent personnel from being locked inside, e.g. an escape hatch that can be opened only from the inside, or locking and latching mechanisms on the door(s) that permit a locked door to be opened from the inside.

F3.7.7 Toxic materials. The container shall be constructed of materials that, in their cured, dried, or other final processed state, do not present a health hazard to personnel during transportation, operation, or maintenance of the container. Exposure of the container to temperatures of 160 °F for extended periods shall not result in accumulation of toxic vapors inside the container that exceed the National Institute of Safety and Health (NIOSH) Threshold Limit Values for the substances present.

F3.7.8 Fire resistance. The container panels shall be fabricated of fire resistant, self-extinguishing materials.

F3.8 Economic life. The container shall have a projected economic life of not less than fifteen years under the service conditions described herein.

F3.9 Reliability/Maintainability. The design of the container shall provide a Mission Capable Status rate of 90% with 80% confidence.

F3.10 Ease of maintenance.

F3.10.1 Access. It shall be possible for the majority of Army personnel to perform preventative maintenance on the container, the generator and the ECU without dismounting the generator or ECU from the container, and without removing or disassembling any part of the container (see Appendix D).

F3.10.2 Latches. All latches utilized for erection and closing of the container shall be properly adjusted before the container is offered for acceptance by the Government.

F3.10.3 Fastening devices. Screws, pins, bolts, and other reuseable fasteners shall be installed with means for preventing loss of tightness. The methods for preventing loss of tightness shall be according to accepted engineering standards and practices. No such parts subject to removal or adjustment shall be swaged, staked, or otherwise deformed. Components of the container subject to repair by replacement shall not be mounted with permanent fasteners.

F3.10.4 Cleaning. The container shall be washable inside and out. Any features within the

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container that could become collection points for water shall be provided with drains.

F3.10.5 Protective finish. Metal parts shall be plated or painted to protect them from corrosion. Cleaning, treating, and painting of the container shall conform to the requirements of MIL-STD-171, finish 7.3.1 plus 20.24 for aluminum, and finish 5.1.1 plus 20.24 for ferrous metals. NOTE: These finishes provide topcoats that are Chemical Agent Resistant Coatings (CARC) conforming to MIL-C-46168 or MIL-C-53039 for exteriors and MIL-PRF-22750 for interiors.)

#### F4. VERIFICATION

F4.1 General provisions. The inspections (examinations and tests) herein shall be performed to determine whether the item conforms to Section 3 of this specification.

F4.1.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2)
- b. Conformance inspection (see 4.3)

F4.1.2 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified herein.

#### F4.2 First article inspection.

F4.2.1 Submission. The contractor shall submit a first article sample as designated by the Contracting Officer for evaluation in accordance with the specified verification methods of Table F4. The first article inspection shall consist of a minimum of 1 complete container.

F4.2.2 Inspections to be performed. As determined by the Government, the first article assemblies, components and test specimens may be subjected to any or all of the verification methods specified (see Table F4). Unless otherwise specified all the inspections shall be performed.

TABLE F4. Requirement/verification matrix

<div style="display: flex; justify-content: space-between;"> <div> <u>Verification Methods</u>  N - Not Applicable  1 - Analysis  2 - Demonstration  3 - Examination  4 - Test (F = First Article only) </div> <div> <u>Verification Class</u>  A = First Article  B = Conformance </div> </div>									
Title	Section 3 Requirement	Verification Method					Verification Class		Section 4 Requirement
		N	1	2	3	4	A	B	
Locks	F3.4.1.1				X		X	X	F4.5.1.1
Anti-tampering measures	F3.4.1.2				X		X		F4.5.1.2
Loss and damage prevention	F3.4.1.3				X		X		F4.5.1.3

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Door static load	F3.4.1.3.1					X	X		F4.5.1.3.1
Wind gust load	F3.4.1.3.2					X	X		F4.5.1.3.2
Electrical outlets	F3.4.2				X		X		F4.5.2
Lighting	F3.4.3				X		X	X	F4.5.3
Erecting and striking	F3.4.4			X			X		F4.5.4
Panel flatness	F3.4.5.1				X		X	X	F4.5.5.1
Panel bonding	F3.4.5.2				X		X	X	F4.5.5.2
Safety Certification	F3.4.6.1				X		X		F4.5.6.1
Overall dimensions	F3.4.6.2				X		X		F4.5.6.2
Tare mass	F3.4.6.3				X		X		F4.5.6.3
Gross mass rating	F3.4.6.4				X		X		F4.5.6.4
Corner fittings	F3.4.6.5				X		X		F4.5.6.5
Decompression vent	F3.4.7.1.1				X		X		F4.5.7.1.1
Flight maneuver forces	F3.4.7.1.2		X				X		F4.5.7.1.2
Transport provision identification	F3.4.7.2				X		X	X	F4.5.7.2
Helicopter external lift	F3.4.7.3		X				X		F4.5.7.3
Base Strength	F3.4.8.1					X	X		F4.5.8.1
Stacking capability	F3.4.8.2					X	X		F4.5.8.2
Side walls	F3.4.8.3.1					X	X		F4.5.8.3.1
End walls	F3.4.8.3.2					X	X		F4.5.8.3.2
Transverse rigidity	F3.4.8.4					X	X		F4.5.8.4
Longitudinal rigidity	F3.4.8.5					X	X		F4.5.8.5
ISO lock rail car restraint capability	F3.4.9.1					X	X		F4.5.9.1
Standard flatcar restraint capability	F3.4.9.2					X	X		F4.5.9.2
Load transfer area	F3.4.10.1				X		X		F4.5.10.1
Tactical vehicle transport	F3.4.10.2					X	X		F4.5.10.2
Drop	F3.4.11.1					X	X		F4.5.11.1 through F4.5.11.1.2
Upper Fittings	F3.4.11.2.1		X				X		F4.5.11.2.1 through F4.5.11.2.1.2
Lower fittings	F3.4.11.2.2		X				X		F4.5.11.2.2 through F4.5.11.2.2.2
Fork lift pockets	F3.4.11.3					X	X		F4.5.11.3
Impact resistance	F3.4.11.4					X	X		F4.5.11.4
Floor loading capability	F3.4.11.5					X	X		F4.5.11.5
Roof loading capability	F3.4.11.6					X	X		F4.5.11.6
External power	F3.5.1.1				X		X		F4.6.1.1

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Internal power	F3.5.1.2				X		X		F4.6.1.2
Human interface	F3.5.2				X		X		F4.6.2
Protective clothing	F3.5.2.1			X			X		F4.6.2.1
Illumination level	F3.5.2.2				X		X		F4.6.2.2
Door opening	F3.5.2.3				X		X		F4.6.2.3
Plates and labels	F3.5.3				X		X		F4.6.3
Hazard identification	F3.5.3.3				X		X	X	F4.6.3.3
Communications	F3.5.4				X		X		F4.6.4
Environmental protection	F3.6.1				X		X		F4.7.1
Protective coloration	F3.6.2.1				X		X	X	F4.7.2.1
Blackout conditions	F3.6.2.2					X	X	X	F4.7.2.2
Nuclear, Biological, and Chemical Contamination Survivability	F3.6.2.3		X				X		F4.7.2.3
Operating temperatures	F3.6.3.1					X	X		F4.7.3.1.1 & F4.7.3.1.2
Differential temperature	F3.6.3.2					X	X		F4.7.3.2
Storage environment	F3.6.4.					X	X		F4.7.4.1 & F4.7.4.2
Weather-tightness	F3.6.5					X	X	X	F4.7.5
Interior environment	F3.6.6			X			X		F4.7.6
Heat transfer	F3.6.7					X	X		F4.7.7
Fungus and moisture	F3.6.8				X		X		F4.7.8
Ozone	F3.6.9				X		X		F4.7.9
Marine environment	F3.6.10					X	X		F4.7.10
Desert environment	F3.6.11					X	X		F4.7.11
Physical hazard control	F3.7.1				X		X	X	F4.8.1
Physical strain control	F3.7.2			X			X		F4.8.2
Electrical ground	F3.7.3				X		X	X	F4.8.3
Steps	F3.7.4				X		X	X	F4.8.4
Tread surfaces	F3.7.5				X		X	X	F4.8.5
Anti-Entrapment Measures	F3.7.6				X		X	X	F4.8.6
Toxic materials	F3.7.7		X				X		F4.8.7
Fire resistance	F3.7.8					X	X		F4.8.8
Economic life	F3.8		X				X		F4.9
Reliability/Maintainability	F3.9		X				X		F4.10
Access	F3.10.1			X			X		F4.11.1
Latches	F3.10.2			X			X	X	F4.11.2
Fastening devices	F3.10.3				X		X		F4.11.3
Cleaning	F3.10.4				X		X		F4.11.4
Protective finish	F3.10.5				X		X	X	F4.11.5

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F4.2.3 Rejection. If any test assembly, test specimen or test component fails to comply with any of the applicable requirements, the first article sample shall be rejected. The Government reserves the right to terminate inspection upon any failure of a test assembly, specimen or component to comply with any of the requirements.

F4.3 Conformance inspection.

F4.3.1 Compliance. Conformance inspections shall be applied to production units being offered for acceptance under the contract. These inspections shall include all verifications listed in Table F4.

F4.3.2 Inspection lot formation. Lot formation shall be in accordance with Section 4 of MIL-STD-1916.

F4.3.3 Sampling plan determination. Conformance verification methods are specified in Table F4. When required by contract or cited herein, attribute sampling inspections shall be conducted in accordance with MIL-STD-1916 using verification level I.

F4.3.4 Rejection. Failure of any unit to pass any verification shall be cause for rejection of the unit.

F4.4 Preparation. Prepare the container for testing by performing normal service, lubrication, and adjustment as recommended by the manufacturer. This specifically includes the use of lubricants tailored for the temperature conditions encountered in each test.

F4.5 Tests and inspections.

F4.5.1 Physical security.

F4.5.1.1 Locks. Verify that the locking of the container is accomplished with padlock(s), and that the hasp and staple or other locking devices incorporated in the container accept key-operated, tumbler-type padlocks conforming to CID A-A-59486A, "Dash 2", which have a normal shackle length and a shackle diameter of  $0.343 \pm 0.040$  inch.

F4.5.1.2 Anti-tampering measures. When prepared for transport and storage, verify that the padlocks on the container are plainly visible on the container exterior and that it is not possible to use or remove any of the equipment stored in the container without either removing the locks or visibly damaging the container.

F4.5.1.3 Loss and damage prevention. Verify that all doors, panels, and other covers for openings in the container are permanently affixed to the container.

F4.5.1.3.1 Door static load. Each vertically hinged door shall have a 200-lb (90-kg) downward load applied at the edge opposite from the hinge pivot with door open to 90°. The load shall be removed and the door examined after 30 minutes. Evidence of unbonded or delaminated components, fracture or permanent deformation of hardware, and binding of the door shall each be cause for rejection.

F4.5.1.3.2 Wind gust load. A wind gust load test shall be performed with the door(s) in the open

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position(s), held by the doorstop device(s). A fixture shall be attached to the midpoint of the locking edge of the door that shall permit application of the following horizontal forces, using free running pulleys to transmit the forces from weights and a 1/4-in (6-mm) diameter steel cable (the container and pulley frames shall be rigidly held in place): a) A static load equal to 10 lb/ft<sup>2</sup> (49 kg/m<sup>2</sup>) (i.e. 10 lb times door area in square feet). b) A dynamic load of 50 ft-lb (222 N) provided by a 50 lb (20 kg) weight dropped five times from a height of 12 in (300 mm). This test shall be performed from both sides of the open door. Evidence of unbonded or delaminated components, fracture or permanent deformation of hardware, and binding of the door shall each be cause for rejection.

F4.5.2 Electrical outlets. Verify that branch circuits and NEMA 5-15R power outlets are provided both inside and outside the container. Verify that there are branch circuits with suitable amperage capacities and overload protection installed in the container. Also verify that there are NEMA 15-R electrical outlets on both ends of the container exterior, and two 208 volt 3-phase outlet for the air compressor near the generator, and that the exterior electrical outlets are weather-tight.

F4.5.3 Lighting. Verify the container provides permanently mounted 110 volt AC interior lighting and NVD safe light. Verify that two 500-watt white lights on telescoping stands are provided with the container.

F4.5.4 Erecting and striking. Verify that the container is provided with screw jacks or other leveling devices. The container shall be erected and leveled on a firm surface having a 24 in. (610 mm) differential in grade to the diagonal dimension of the container floor. The container shall then be struck and returned to transport mode. Failure to bring the container to level and failure to accomplish either erection or striking of the container within two man-hours shall each be cause for rejection.

F4.5.5 Workmanship.

F4.5.5.1 Panel flatness. The flatness of each panel shall be inspected using two 48-in. (1200-mm) long straight edges that are flat within 0.005-in. (0.1-mm) total. Two 0.125 in (3-mm) shims shall be used along the one straight edge, located at the extremes of the edge. One 0.125 in (3-mm) shim shall be used along the other straight edge, located at the center of the edge. GO/NO-GO measurements will be taken in both horizontal and vertical directions on the interior and exterior of the container panels. Panels found to be bowed or cupped more than 0.125 in. (3 mm) per each 4-ft (1.3-m) length measured across the container walls both horizontally and vertically shall be rejected.

F4.5.5.2 Panel delamination. Inspect each laminated panel for unbonded/delaminated areas by either a “tapping” test or other government-approved nondestructive test method to ensure that the panel layers are completely bonded and free of delaminations. Perform the tapping test with a soft face mallet of sufficient hardness to produce a distinct tapping noise when struck against the panel surface without denting the panel or marring the panel finish. Tap test the panel in each 6 by 6-in. (150 by 150-mm) square of panel surface area. A change in the sound the panel makes when struck is indicative of an unbonded or delaminated area. Subject to approval by the government, the manufacturer may choose to use a nondestructive method other than the tapping

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test for each bonded panel. An engineering report substantiating the validity of the optional nondestructive testing method must be submitted to the government for approval. Any delaminated area on any panel shall be cause for rejection.

**F4.5.6 Transportability.**

**F4.5.6.1 Safety certification.** Verify that the contractor has documentary evidence that the containers have been certified safe by the Coast Guard or other authorized Approval Authority as required by Code of Federal Regulations (CFR) 49, Parts 450 through 453.

**F4.5.6.2 Overall dimensions.** Measure the container and verify that the overall exterior dimensions of the containers conform to those of ISO 668 general-purpose freight containers designated 1C, as shown in Table F1. Verify that no part of the container, including padlocks, extends beyond the planes defined by the outer surfaces of the corner fittings.

**F4.5.6.3 Tare mass.** Verify that the container has been weighed on a certified scale, and that the weight of the empty container (as delivered) does not exceed 4,500 lbs.

**F4.5.6.4 Gross mass rating.** Verify that the contractor certifies the container is designed for a maximum combined weight of container and cargo of at least 15,000 lbs. (Certification is dependant on conformance to the requirements contained herein.)

**F4.5.6.5 Corner fittings.** Verify the containers are equipped with corner fittings, and measure them to verify that they conform to ISO 1161 (See Figures F-6 through F-9). Measure the distances between the corner fittings and verify that they conform to ISO 668 (See Figure F-10). Verify that the upper faces of the top corner fittings protrude above the top of the rest of the container by minimum of 1/4" (6 mm) and that the lower faces of the bottom corner fittings protrude below the bottom of the container by a minimum of 7/16" (11 mm). (Reference ISO 1496-1)

**F4.5.7 Air transport.**

**F4.5.7.1 Cargo aircraft.**

**F4.5.7.1.1 Decompression vent.** Verify that the total area of the container vent opening(s) at the narrowest point is at least 24 in<sup>2</sup> (154.8 cm<sup>2</sup>). Verify that the vent(s) is unlikely to be blocked or reduced by cargo load shift.

**F4.5.7.1.2 Flight maneuver forces.** Verify that the contractor has provided a recommended tie-down pattern for fastening the containers to the pallet tie-down rings with CGU-1/B tie down devices. Verify that the contractor has documented, certified, engineering analysis or test results showing that, when attached to the pallets using the contractor's recommended tie-down pattern, the containers, loaded to their rated gross weight with all cargo tied down to the container floor and the generator and ECU installed, will remain on the pallets, and have the mechanical strength to meet the criteria specified in MIL-HDBK-1791 without suffering permanent deformation or other damage.

**F4.5.7.2 Transport provision identification.** Verify that all lifting provisions, tie down provisions, and center of balance are identified and labeled in accordance with MIL-STD-129.



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F4.5.7.3 Helicopter external lift. Verify that the container, with generator and ECU installed and loaded to its rated capacity, has been certified suitable for EAT by CH-47 and larger cargo helicopters in accordance with MIL-STD-913, either through analysis or flight test.

F4.5.8 Marine transport.

F4.5.8.1 Base Strength. The container shall be placed on four level 1 in (25.4 mm) thick steel pads, one under each bottom corner fitting. The pads shall be centralized under the fittings, and shall be substantially of the same plan dimensions as the fittings. The ECU and generator shall then be installed in the container, and a load uniformly distributed over the container floor in such a way that the combined mass of the container and the test load is equal to 27,000 lbs (12,247 Kg). The distance between the bottom of the side rail and the upper surfaces of the pads shall be measured along each side. Deflection of either side more than 8mm below the plane of the pad tops shall be cause for rejection.

F4.5.8.2 Stacking capability. The container shall be placed on four level pads, one under each bottom corner fitting. The pads shall be centralized under the fittings, and shall be substantially of the same plan dimensions as the fittings. The container, with ECU and generator installed, shall have a load uniformly distributed over the floor in such a way that the combined mass of the container and the test load is equal to 27,000 lbs (12,247 Kg). The container shall be subjected to vertical forces, either 381,275 lbf (1,696 kN) applied to all four corner fittings simultaneously or 190,367 lbf (848 kN) applied to each pair of end fittings. The forces shall be applied through a test fixture equipped with ISO corner fittings, or equivalent fittings that have imprints of the same geometry (i.e. with the same external dimensions, chamfered aperture and rounded edges) as the bottom face of the bottom corner fittings. If equivalent fittings are used, they shall be designed to produce the same effect on the container under the test loads as when corner fittings are used. In all cases, the forces shall be applied in such a manner that rotation of the planes through which the forces are applied and on which the container is supported is minimized. Each corner fitting or equivalent test fitting shall be offset in the same direction by 1 in (25.4 mm) laterally and 1.5 in (38 mm) longitudinally. Following the test, the container shall be examined, and the dimensions between the corner fittings re-measured. Permanent deformation or other damage that renders the container unsuitable for use or failure of the corner fitting locations to conform to ISO 668 (See Figure F-10) following the test shall each be cause for rejection.

F4.5.8.3 Panel strength.

F4.5.8.3.1 Side walls. Subject each side wall of the container to an internal uniformly distributed load of 5820 lb (2640 kg) applied separately and arranged to allow free deflection of the wall. Apply the loads for not less than 5 minutes. Permanent deformation or other damage that renders the container unsuitable for use or failure of the corner fitting locations to conform to ISO 668 (See Figure F-10) following the test shall each be cause for rejection.

F4.5.8.3.2 End walls. Subject each end wall of the container to an internal, uniformly distributed load of 3880 lb (1760 kg), applied separately and arranged to allow free deflection of the wall. Apply the loads for not less than 5 minutes. Permanent deformation or other damage that renders the container unsuitable for use or failure of the corner fitting locations to conform to

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ISO 668 (See Figure F-10) following the test shall each be cause for rejection.

**F4.5.8.4 Transverse rigidity.** The container in tare condition shall be placed on four level supports, one under each corner fitting, and shall be restrained against lateral and vertical movement by means of anchor devices acting through the bottom apertures of the bottom corner fittings. Lateral restraint shall be provided only at a bottom corner fitting diagonally opposite to and in the same end frame as a top corner fitting to which force is applied. When testing the two end frames separately, vertical restraint shall be applied only at the end frame under test. The distances between the diagonally opposite corners on each end shall be measured. Forces of 33,720 lbf (150 kN) shall be applied either separately or simultaneously to each of the top fittings on one side of the container in lines parallel both to the base and to the planes of the ends of the container. The forces shall be applied first towards and then away from the top corner fittings. If an end is not essentially symmetrical about its own vertical centerline, both sides of that end shall be tested. While the full transverse force is applied, the distances between the diagonally opposite corners on the end under test shall again be measured. Sideways deflection of the top of the container end frame with respect to the bottom of the container end frame at the times it is subjected to the full transverse force which causes the sum of the changes in the length of the diagonals to exceed 2.36 in (60 mm) shall be cause for rejection. Following the test, the container shall be examined, and the dimensions between the corner fittings re-measured. Permanent deformation or other damage that renders the container unsuitable for use, or failure of the corner fitting locations to conform to ISO 668 (See Figure F-10), shall also be cause for rejection.

**F4.5.8.5 Longitudinal rigidity.** The container in tare condition shall be placed on four level supports, one under each corner fitting, and shall be restrained against longitudinal and vertical movement by means of anchor devices acting through the bottom apertures of the bottom corner fittings. Longitudinal restraint shall be provided only at a bottom corner fitting diagonally opposite to and in the same side structure as a top corner fitting to which force is applied. The distances between the diagonally opposite corners on each side shall be measured. Forces of 75 kN shall be applied either separately or simultaneously to each of the top corner fittings on one end of the container in lines parallel both to the base of the container and to the planes of the sides of the container. The forces shall be applied first towards and then away from the top corner fitting. If a side is not essentially symmetrical about its own vertical centerline, both ends of that side shall be tested. While the full transverse force is applied, the distances between the diagonally opposite corners on the end under test shall again be measured. Sideways deflection of the top of the container side structure with respect to the bottom of the container side structure at the times it is subjected to the full transverse force which causes the sum of the changes in the length of the diagonals to exceed 1.0 in (25 mm) shall be cause for rejection. Following the test, the container shall be examined, and the dimensions between the corner fittings re-measured. Permanent deformation or other damage that renders the container unsuitable for use, or failure of the corner fitting locations to conform to ISO 668 (See Figure F-10), shall also be cause for rejection.

**F4.5.9 Rail transport.**

**F4.5.9.1 ISO lock rail car restraint capability.** The container, with ECU and generator installed,

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shall have a load uniformly distributed over the cargo floor in such a way that the combined mass of the container and the uniformly distributed test load is equal to 15,000 lbs (6875 kg), and it shall be secured longitudinally to rigid anchor points through the bottom apertures of the bottom corner fittings at one end of the container. A force of 30,000 lbs shall be applied horizontally to the container through the bottom apertures of the other bottom corner fittings, first towards and then away from the anchor points. Following the test, the container shall be examined, and the dimensions between the corner fittings re-measured. Permanent deformation or other damage that renders the container unsuitable for use or failure of the corner fitting locations to conform to ISO 668 (See Figure F-10) shall each be cause for rejection.

F4.5.9.2 Standard flatcar restraint capability. The container, with ECU and generator installed, shall have a load uniformly distributed over the cargo floor in such a way that the combined mass of the container and the uniformly distributed test load is equal to 15,000 lbs (6875 kg). The container shall then be tested in accordance with MIL-STD-810, Method 516.5, Procedure VII - Rail Impact. Binding of any door or panel; dislodgment of or damage to any stored item; damage to any part of the container; or failure of the corner fitting locations to conform to ISO 668 (See Figure F-10) following the test shall each be cause for rejection.

F4.5.10 Motor vehicle transport.

F4.5.10.1 Load transfer area. Verify that the intermediate transverse support members of the container base are all spaced at 39 in (1,000 mm) apart or less.

F4.5.10.2 Tactical vehicle transport. The container, with ECU and generator installed, shall have a load uniformly distributed over the cargo floor in such a way that the combined mass of the container and the uniformly distributed test load is equal to 15,000 lbs (6875 kg). Transport the container over a mission/field support test track that simulates in-service conditions as follows: 600 miles on a Secondary Road course of native soil composition, 50 miles on a moderately rough Cross Country course of native loam with quarry spall composition and 50 miles on a Belgian Block course. In addition, 5 laps around a segmented Road Shock and Vibration Course consisting of 2-inch Washboard, 2 to 4 inch Radial Washboard, 3-inch Spaced Bump and a 6-inch Washboard shall be required. Maximum safe speed for the surface and conditions shall be maintained; not to exceed 35 mph on secondary roads, 15 mph for travel cross-country, and 15 mph for Belgian Block course. Speeds for the Road Shock and Vibration course shall vary between 2-10 mph. Following the test, the container shall be examined, and the dimensions between the corner fittings re-measured. Permanent deformation or other damage that renders the container unsuitable for use, and failure of the corner fitting locations to conform to ISO 668 (See Figure F-10) following the test, shall each be cause for rejection. Any damage to, or displacement of, any component, accessory, part, or tool installed in or on the container, or the failure of any item of equipment in the container to function properly upon completion of the test shall also be cause for rejection.

F4.5.11 Transport handling.

F4.5.11.1 Drop. The container, with ECU and generator installed, shall have a load uniformly distributed over the cargo floor in such a way that the combined mass of the container and the uniformly distributed test load is equal to 15,000 lbs (6875 kg). The container shall be subjected

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to a series of drops of 6 in. (150 mm) onto a level concrete type surface utilizing a quick release hook that ensures that the container falls freely the full 6 in (150 mm). Any evidence of splits or tears on the bottom, permanent deformation, buckling, delamination of any panel, structural damage to any part of the container, doors or panels not operating properly, and failure of the corner fitting locations to conform to ISO 668 (See Figure F-10) following any drop shall each be cause for rejection.

F4.5.11.1.1 Flat Drop. Lift the container 6 in. (150 mm) using a four cable sling and allow the container to fall freely so that the bottom impacts onto a hard concrete surface.

F4.5.11.1.2 Rotational Drop. Place a 4 in. (100 mm) high (nominal) board under the ISO fittings at one edge of the container. Lift the opposite edge of the container 6 + 14 in. (160 mm) from the ground. Take measurements from the outer edge of the ISO fittings at the two raised corners of the container. The range of the two measurements shall not exceed 1/4 in. (6 mm). Release the container and allow it to fall freely such that the ISO fittings impact onto a hard concrete surface. After all four rotational drops, the requirements of 5.12 shall be met.

F4.5.11.2 Overhead lift. All lifting provisions shall be analyzed using Computer Aided Engineering (CAE) structural analysis tools prior to any testing. Either the contractor or the government will perform this analysis. In cases where the structural analysis indicates that the provisions will clearly pass the test, actual physical testing will not be necessary. In cases where the structural analysis indicates that the provisions will clearly fail the test, a redesign of the provisions will be recommended to the contractor. If the structural analysis indicates that the provisions will marginally pass or fail the test, redesign or testing will be recommended to the contractor. The appropriate Government service transportability agent shall make the decision on using analysis results in lieu of actual physical testing. Whenever possible, such decisions will seek to reduce the overall cost impact based on sound risk/benefit analyses. If testing is required, all lifting provisions shall be tested attached to the container. For test purposes, only wire rope, wire rope with a thimble loop, or a chain attached to the provision shall be used. Textile straps, such as nylon and polyester (Dacron) and synthetic ropes, shall not be used. The loads applied during testing shall not be less than the design limit load requirement and not more than 10 percent in excess.

F4.5.11.2.1 External Air Transport (EAT) Lift. Prior to testing, the contractor shall provide detailed drawings of the container, and any three-dimensional Computer-Aided Design/Computer-Aided Engineering (3D CAD/CAE) models they have developed of the container, its lifting provisions, and their supporting structure. The government will use this information to perform a CAE structural analysis to help identify potential design deficiencies in the provisions and surrounding structure. In lieu of providing this information, the contractor can provide the results of their own CAE structural analysis.

F4.5.11.2.1.1 Analysis. The CAE structural analysis shall meet the following requirements:

- a) A static pull to the required 16,971 lb (7698 kg) per lift provision design limit load shall be simulated on all four upper lift provisions.
- b) The angle the simulated static pull shall duplicate a sling angle of 45° as shown in

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Figure F-2.

- c) Failure is defined as any stress level determined by the analysis to exceed the yield strength of the lift provision material.
- d) If the structural analysis indicates that the provisions have the strength to withstand the loads applied to it, actual physical test will not be required. The appropriate Government service transportability agent will make this determination.

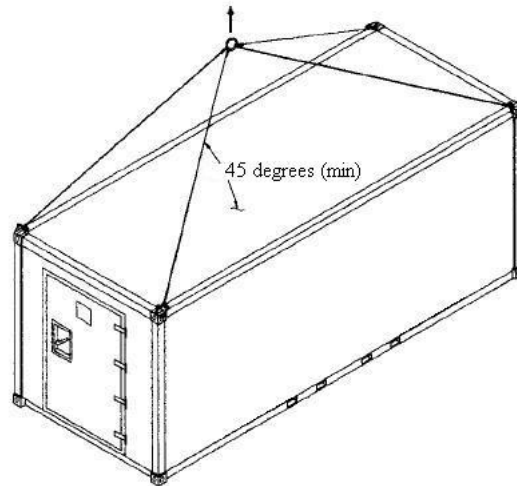


Figure F-2. Single-point Top Lift

F4.5.11.2.1.2 Test. Physical testing, if required, shall meet the following requirements:

- a) The container with generator and ECU shall be prepared such that the total weight is 48,000 lbs (21,772 kg). The payload may be in any convenient form that may be uniformly distributed over the floor. If solid weights are used, the floor will be protected from sharp objects by 1/2 to 3/4-in. (13 to 19-mm) thick plywood covering the floor. (The container must be located on a flat, solid surface while the loads are installed.) All doors and panels shall be closed and secured.
- b) Connect a four-legged sling to the upper ISO fittings maintaining a 45° minimum angle with the roof (see Figure F-2). Lift the container from the ground and allow it to remain suspended for 5 minutes.
- c) Slowly lower the container to the ground and inspect for signs of damage.
- d) If the CAE evaluation shows that the provisions may fail under two-point lift, an additional test using an 8-foot by 20-foot container spreader bar, or equivalent, shall be performed.
- e) Remove the payload, erect the container and thoroughly inspect the container for damage.
- f) Failure is defined as any visible permanent deformation, yielding, or bending of the lifting provision or other structural component. A possible failure indication during the

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initial material analysis shall be justification to use more detailed analysis and testing methods (for example, calibrated measurements, finite element analysis, magnetic particle inspection, X-ray, fatigue testing, ultimate testing, and so forth). Any evidence of cracks in welds, unbonded components, or loosening of structural components shall also constitute failure of this test.

g) The contractor shall provide a material analysis showing the ultimate load is not less than 1.5 times the required design limit load for the lift provisions.

F4.5.11.2.2 Crane. Prior to testing, the contractor shall provide detailed drawings of the container, and any three-dimensional Computer-Aided Design/Computer-Aided Engineering (3D CAD/CAE) models they have developed of the container, its lifting provisions, and their supporting structure. The government will use this information to perform a CAE structural analysis to help identify potential design deficiencies in the provisions and surrounding structure. In lieu of providing this information, the contractor can provide the results of their own CAE structural analysis.

F4.5.11.2.2.1 Analysis. The CAE structural analysis shall meet the following requirements:

- a) A static pull to the required 12,198 lb (5,533 kg) per lift provision design limit load shall be simulated on all four lower lift provisions.
- b) The angle the simulated static pull shall duplicate a sling angle of 45° as shown in Figure F-3.
- c) A vertical static pull of 8,625 lb (3912 kg) per lift provision shall be simulated on all four lower lift provisions to simulate lift with an 8-foot by 20-foot container spreader bar.
- d) ) Failure is defined as any stress level determined by the analysis to exceed the yield strength of the lift provision material.
- e) If the structural analysis indicates that the provisions have the strength to withstand the loads applied to it, actual physical test will not be required. The appropriate Government service transportability agent will make this determination.

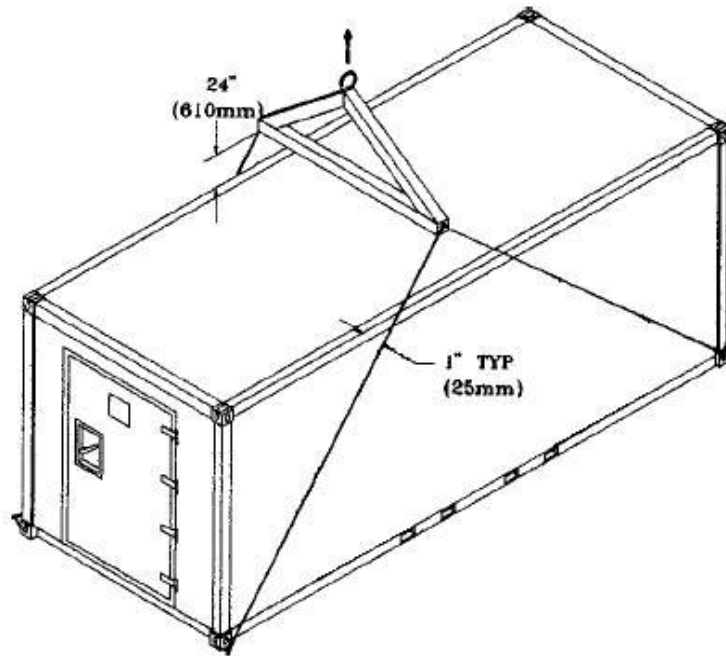


Figure F-3. Bottom Lift by Crane

F4.5.11.2.2.2 Test. Physical testing, if required, shall meet the following requirements:

- a) The container with generator and ECU shall be prepared such that the total weight is 34,500 lbs (15,649 kg). The payload may be in any convenient form that may be uniformly distributed over the floor. If solid weights are used, the floor will be protected from sharp objects by 1/2 to 3/4-in. (13 to 19-mm) thick plywood covering the floor. (The container must be located on a flat, solid surface while the loads are installed.) All doors and panels shall be closed and secured.
- b) Connect a two-point spreader bar to the lower ISO fittings maintaining a 45° minimum angle with the roof (see Figure F-3). Lift the container from the ground and allow it to remain suspended for 5 minutes.
- c) Slowly lower the container to the ground and inspect for signs of damage.
- d) If the CAE evaluation shows that the provisions may fail when lifted by a four-point spreader bar, an additional test using an 8-foot by 20-foot container spreader bar, or equivalent, shall be performed.
- e) Remove the payload, erect the container and thoroughly inspect the container for damage.
- f) Failure is defined as any visible permanent deformation, yielding, or bending of the lifting provision or other structural component. A possible failure indication during the initial material analysis shall be justification to use more detailed analysis and testing methods (for example, calibrated measurements, finite element analysis, magnetic

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particle inspection, X-ray, fatigue testing, ultimate testing, and so forth). Any evidence of cracks in welds, unbonded components, or loosening of structural components shall also constitute failure of this test.

g) The contractor shall provide a material analysis showing the ultimate load is not less than 1.5 times the required design limit load for the provisions.

**F4.5.11.3 Fork lift pockets.** Verify that the container has fork lift pockets, and measure them for conformance. The container, with ECU and generator installed, shall have a load uniformly distributed over the cargo floor in such a way that the combined mass of the container and the uniformly distributed test load is equal to 24,000 lbs (10,886 kg). The container shall be supported on two horizontal bars, each 8 in (200 mm) wide, projecting  $72 \pm 1/8$  in (1,828 mm  $\pm$  3 mm) into the outer forklift pockets, measured from the outside face of the side of the container. The bars shall be centered within the pockets. The container shall be supported for 5 min and then lowered to the ground. Absence of one or both pockets, any pocket that does not pass completely through the container base, any pocket that does not meet the minimum dimensional requirements of Appendix B, or deformation or other damage to the to the container frame, roof, floor, or walls shall each be cause for rejection.

**F4.5.11.4 Impact resistance.** Specimens of the container floor and roof panel material 24-in. (610-mm) square shall each be subjected a blow from a 70-lb (30-kg) steel cylinder 3 in. (80 mm) in diameter with a hemispherical end, dropped from a height of 30 in. (800 mm). The cylinder shall be oriented and dropped vertically so that the center of the hemispherical end of the cylinder strikes the center of the specimen on a horizontal plane. The cylinder shall not be permitted to re-impact the specimen after the first impact. A specimen(s) of the container side wall and end wall panel material shall be subjected to a blow from the same steel cylinder dropped from a height of 16 in. (410 mm). The panel specimens shall be fabricated in accordance with Figure F-4. The specimens shall contain only one continuous piece of core material. The specimen s shall be supported along each of their four edges by a framework backed by concrete. The framework shall be made of four pieces of 2 by 4-in. (50 x 100-mm) nominal softwood lumber. The frame shall be rigidly bolted together to form a square 24 in. (610 mm) on a side (outside dimensions) and 4-in. (100-mm) nominal high. The frame shall rest on the 24-in. (610-mm) nominal wide face. Each specimen shall be bolted to the frame with two 1/4-in. (6-mm) diameter bolts per edge. Care should be taken that the appropriate surface of the specimen faces the impact: exterior surfaces for the roof, side wall and end wall specimens, and the interior surface for the floor specimen. The bolts shall be tightened against the specimen and then backed off so that there is a gap of 0.010-in. (0.3-mm) nominal between the bolt head and the panel. The specimen shall be cross-sectioned through the impact area and visually examined. Rupture of the impacted or opposite skin; delamination of the opposite skin; delamination of the impacted skin from the core, crushing of the core, or collapsing of the core beyond a 3-in. (80-mm) radius (3.12 in. (90 mm) radius for the floor panel) from the center of impact; and core shear failure outside a 5-inch (127 mm) radius from the center of impact shall each be cause for rejection.



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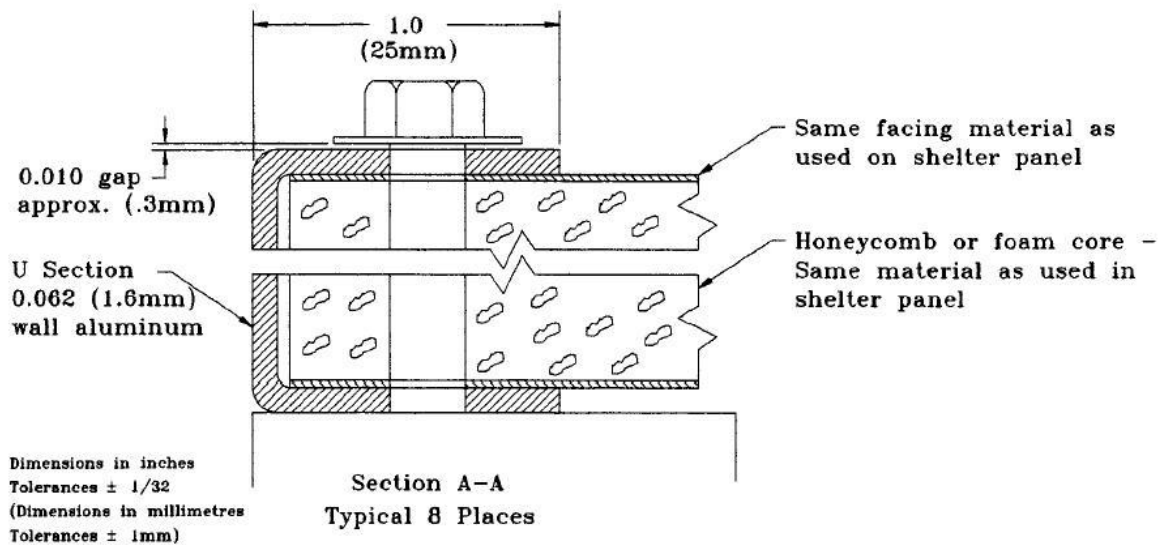
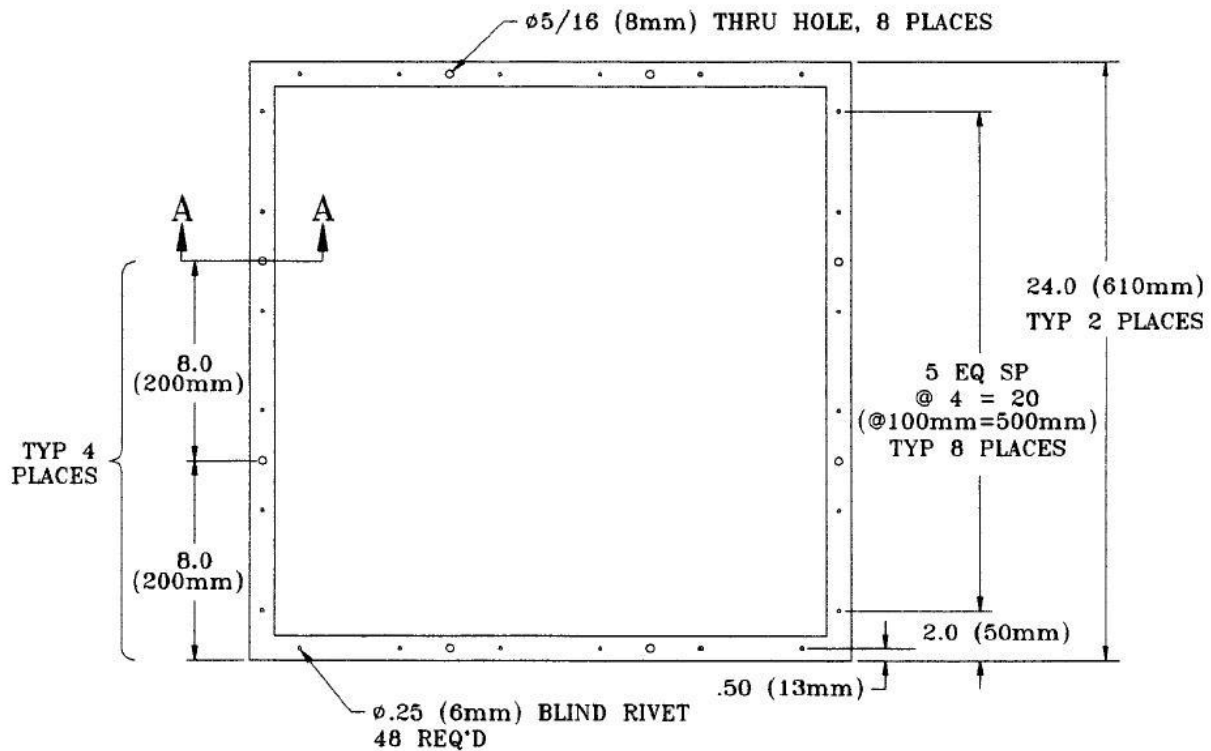


Figure F-4. Panel Impact Resistance Samples

F4.5.11.5 Floor loading capability. The container cargo floor shall be uniformly loaded to 80 lb/ft<sup>2</sup> (390 kg/m<sup>2</sup>) for at least 30 minutes Prior to removal of the uniform load, all doors and removable panels shall be operated to ensure that no interference exists between components. The uniform load shall then be removed and a concentrated 2,000-lb (900 kg) load shall be

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applied over a 4 ft<sup>2</sup> (0.4 m<sup>2</sup>) area centered on the floor and left in position for at least 30 minutes. Prior to removal of the concentrated load, all doors and removable panels shall be operated to ensure that no interference exists between the components. The concentrated load shall then be removed and a point load of 125 lb (57 kg) balanced atop a 1 in<sup>2</sup> (650 mm<sup>2</sup>) block shall be applied for at least 5 minutes to the center of the floor. A thorough inspection of the container shall be made after each test. Evidence of structural damage, panel delamination, or permanent deformation shall each be cause for rejection.

F4.5.11.6 Roof loading capability. The container shall be subjected to a uniform loading of 40 lb/ft<sup>2</sup> (200 kg/m<sup>2</sup>) over the roof surface. After removal of the uniform load, a 660 lb (300 kg) load shall be placed over 2 ft<sup>2</sup> (0.2 m<sup>2</sup>) at the center of the roof. Each load shall be applied for at least 5 minutes. The container will be visually inspected during and after each test. Evidence of permanent deformation, structural damage, panel delamination, or broken seals shall each be cause for rejection.

F4.6 Interfaces.

F4.6.1 Electrical power.

F4.6.1.1 External power. Verify the container is provided with an externally accessible power input connector capable of accepting 100 Amp, 208 volt, 3-phase, 60 Hz AC receptacle consisting of: a wall-mounting receptacle with coupling ring conforming to MIL-C-22992, Class L, Style P comprised of a MS90558 C 44 4 shell, with an MS14055 insert having insert arrangement 44-12, along with a MS90564 44 C weather-tight cover. Also verify the container is supplied with a service box with a capacity of at least 100 amps.

F4.6.1.2 Internal power. Verify the container incorporates provisions for permanently mounting a generator in the front end of the container (opposite the personnel door) and connecting it to the container electrical system. Verify that all mechanical and electrical interfaces for mounting and operating a 62" long by 32" in wide by 37" in high (1575 mm x 813 mm x 940 mm) generator weighing 1,182 lbs (536 kg) are provided. Verify that the mounting provisions provide adequate access for operation and maintenance (Reference TM 9-6115-642-10), and have a sufficient load rating to bear the weight of the generator. Verify that the generator retracts inside the container walls and has a protective door or panel for storage, transport, and NBC survivability. Verify that the generator is present and mounted.

F4.6.2 Human interface. Verify the container complies with the guidelines of Appendix D.

F4.6.2.1 Protective clothing. Verify the container can be set up for operation by troops wearing heavy gloves and winter gear.

F4.6.2.2 Illumination level. With the interior lights of the container turned on and the container door(s) closed, measure the light intensity thirty inches above the container floor, with a luminance meter. Confirm there is at least fifty (50) foot-candles of illumination, and that glare and specular reflection are visually tolerable. Using the color samples of FED-STD-595, verify the interior wall and ceiling surfaces of the container approximate Semi-gloss Green 24533 or Semi-Gloss White 27875 and that the floor approximates Lusterless Gray 36118.

F4.6.2.3 Door opening. Verify that the container has at least one personnel door that is at least

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76 in (1930 mm) high and 48 in (1220 mm) wide.

F4.6.3 Plates and labels. Examine all plates and labels affixed to the container. Affirm that the US English language is used. Examine all plate and label material specification sheets, including marking, engraving techniques. Verify that they are resistant to all environmental elements and petroleum products and will remain legible for 15 years.

F4.6.3.1 Hazard identification. In an operational mode, examine the container for all unguarded physical hazards and verify that all are properly identified and labeled in accordance with ANSI Z535.4.

F4.6.4 Communications. Verify the container is provided with a general-purpose tactical communications pass-through panel providing four binding posts, one female Bayonet Neill Concelman (BNC) connector for RG-58 coaxial cable, two RJ-45 plugs, and one DB9 connector. Verify that the DB9 plugs have weather-tight covers. Verify the interior panel mirrors the exterior panel, and that proper pin-to-pin connections have been made.

F4.7 Environment.

F4.7.1 Environmental protection. Verify the container includes spill containment measures for the generator coolant, fuel, solvent, petroleum, oils, and lubricants.

F4.7.2 Battlefield survivability.

F4.7.2.1 Protective coloration. Verify that the exterior of the container is a tan approximating color chip 33446 of FED-STD 595, unless otherwise specified by the Procurement Contracting Officer.

F4.7.2.2 Blackout conditions. With the container in its operational configuration, the personnel entryway(s) closed and the interior lights on, visually verify the container is light tight. No light generated when the interior lights of the container are illuminated may be visible from any point outside the container when the container is surrounded by darkness in a lightless room. Verify the personnel entryway(s) have an interlock that opens the electrical circuit(s) for the interior lights, so that the lights are completely extinguished before the light-tight seal of the entryway is broken. Verify the interlock feature can be deactivated when not needed.

F4.7.2.3 Nuclear, Biological, and Chemical Contamination Survivability. Verify that documentation certifying exterior of the container can be decontaminated to negligible risk levels, using standard Army decontamination procedures. Also verify that the container is capable of withstanding the materiel damaging effects of NBC contaminants and decontaminants through five contamination/decontamination cycles, without sustaining damage that renders it unserviceable. Documentation shall consist of an analysis from Dugway Proving Ground. An unfavorable report from Dugway shall be cause for rejection, pending corrective action by the contractor. If corrective action is technically or economically impractical, an unfavorable report from Dugway shall be cause for rejection; subject to approval of a waiver by the DA Nuclear and Chemical Survivability Committee Secretariat.

F4.7.3 Operational environment.

F4.7.3.1 Operating temperatures.

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F4.7.3.1.1 High temperature operation. The container shall be tested in accordance with MIL-STD-810, Method 501.4, Procedure II. Temperature/solar radiation cycling shall be in accordance with Table 501.4-I, Ambient Air Conditions. The number of Hot-Dry cycles shall be three. Every hour, all panels and doors shall be opened and closed at least once. Binding of the container doors or panels and deterioration of any container materials shall each be cause for rejection.

F4.7.3.1.2 Low temperature operation. The container shall be tested in accordance with MIL-STD-810, Method 502.4, Procedures II and III. The container shall be placed in an environment with an ambient temperature of -25°F, or lower, for at least 72 hours. The container shall be maintained at a temperature of -25°F, or less, for the duration of the test. The test duration shall be not less than 4 hours. Every hour, all panels and doors shall be opened and closed at least once. Cracking, crazing, embrittlement, or other damage to the container materials and binding of any door, panel, or other part of the container shall each be cause for rejection.

F4.7.3.2 Differential temperature. A simulated solar load sufficient to raise the outer skin temperature to 205°F (96°C) shall be applied uniformly to the container roof. A uniform temperature should be attained gradually within 4 hours and shall be maintained for an additional 4 hours. As a minimum, one thermocouple per 10 ft<sup>2</sup> (1m<sup>2</sup>) of roof shall be uniformly distributed on the entire area of the roof. All of the thermocouples should read 205 ± 15°F (96 ± 8°C) throughout the 4-hour period that the solar load shall be maintained. During this test, the ambient temperature within the container shall be maintained at a maximum of 85°F (29°C). Upon completion of the test, the temperatures of the roof panel interior and exterior shall be allowed to equalize before the roof panel is examined for cupping, bowing, and delamination in accordance with paragraphs 4.5.5.1 and 4.5.5.2. Any evidence of delamination, and cupping or bowing exceeding the specified limits shall each be cause for rejection.

F4.7.4 Storage environment.

F4.7.4.1 High temperature storage. The container shall be tested in accordance with MIL-STD-810, Method 501.4, Procedure I, Storage. Temperature cycling shall be in accordance with Table 501.4-I, Induced Conditions, number of cycles 7. Damage to the container materials or binding of any door, panel, or other part of the container shall be cause for rejection.

F4.7.4.2 Low temperature storage. The container shall be tested in accordance with MIL-STD-810, Method 502.4, Procedure I. The container shall be placed in an environment with an ambient temperature not greater than -50°F for at least 72 hours. After completion of the conditioning period, examine the container for cracking, crazing, embrittlement, or other damage, which shall be cause for rejection. The binding of any door, panel, or other part of the container shall also be cause for rejection.

F4.7.5 Weathertightness. The SATS shall be tested in accordance with MIL-STD-810, Method 506, Procedure II with a nozzle pressure of 40 psig (276 kPa) and a duration of at least 40 minutes. During the test, all items shall be in their storage locations and all doors and panels shall be closed and locked. Immediately following the test open all doors and panels and examine for any evidence of water. Water in any cavity of the container shall be cause for rejection.

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F4.7.6 Interior environment. Verify the container incorporates provisions for permanently mounting a 26" long by 23-3/4" wide by 16" high (660 mm x 603 mm x 406 mm) ECU weighing 200 lbs (91 kg). Verify that all mechanical and electrical interfaces for mounting and operating the unit are provided, including a 208 Volt, 3-phase, 60 Hz circuit rated for at least 35 amps. Verify that the mounting provisions provide adequate access for operation and maintenance (Reference TM 5-4120-386-14), and have a sufficient load rating to bear the weight of the ECU. Verify that the ECU retracts inside the container walls and has a protective door or panel for storage, transport, and NBC survivability. Verify that the ECU is present and installed.

F4.7.7 Heat transfer. The container shall be erected inside a chamber with an automatic control system for maintaining a constant minimum temperature of  $-25^{\circ}\text{F}$  ( $-32^{\circ}\text{C}$ ) when the temperature inside the container is maintained at  $75^{\circ}\text{F}$  ( $23^{\circ}\text{C}$ ). The volume of the test chamber shall be such that the bulk of the container will not interfere with the generation and maintenance of test conditions. The minimum distance from any container panel to adjacent chamber wall shall be 24 in. (610 mm). The generator compartment shall be open, with external air circulating within it; and the ECU panel shall be open with the ECU in operating position. The conditioned airflow shall be suitably baffled to provide free circulation between the container and the chamber walls and ceiling and to provide uniform airflow around the container with the maximum velocity on the container surface of 5 mph (8 km/h). The chamber temperature shall be measured by placing one thermocouple 6 in. (150 mm) away from each corner fitting, and one thermocouple centrally located 6 in. (150 mm) away from each wall and ceiling panel, and one centrally located within the generator compartment. Internal temperature shall be measured with a total of 16 thermocouples, with each located 6 in. (150 mm) away from the panel surface, each shielded from the heat source and positioned as shown in Figure F-5. An electrical resistance heat source, with sufficient power to maintain a stabilized temperature of not less than  $100^{\circ}\text{F}$  ( $56^{\circ}\text{C}$ ) above the outside temperature, shall be used. A heater providing air discharge radially in a  $360^{\circ}$  pattern, with adjustable louvers around the circumference and discharge louvers in the top, is the preferred item for providing uniform heat. Additional fans may be used to ensure that the difference between any two thermocouples is a maximum of  $5^{\circ}\text{F}$  ( $3^{\circ}\text{C}$ ), thereby providing a uniform temperature within the container. Also, the heater resistance elements shall be completely shielded from any interior container surfaces. Temperature conditions shall be considered stable when, for 30 min, internal thermocouple readings remain within  $5^{\circ}\text{F}$  ( $3^{\circ}\text{C}$ ) of one another while the average external temperature remains at  $-25^{\circ} \pm 5^{\circ}\text{F}$  ( $-32 \pm 3^{\circ}\text{C}$ ) and the average internal temperature remains a minimum of  $100^{\circ}\text{F}$  ( $56^{\circ}\text{C}$ ) above the average external temperature. Thermocouple readings shall be recorded every 15 min. After the temperature conditions have stabilized and while maintaining stability, the electrical power to the internal apparatus shall also be recorded every 15 min during which time the power shall not be changed and all apparatus shall operate continuously. Four sets of power readings shall be recorded with an allowable variation of 5 %. The overall coefficient of heat transfer shall be calculated using the average internal and external temperatures, amount of electrical power consumed, and nominal internal surface area.

$$U = \frac{\text{total power consumed-- Btu/hr (watts)}}{SA \times \Delta T}$$

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where:

SA = Nominal inside surface area -  $\text{ft}^2$  ( $\text{m}^2$ ), and  
 $\Delta T$  = Temperature Difference -  $^{\circ}\text{F}$  ( $^{\circ}\text{K}$ ).

The calculated values of the overall heat transfer coefficient shall then be averaged to determine the final average value for the overall heat transfer coefficient. Test results showing the container has an overall heat transfer coefficient greater than  $0.35 \text{ Btu}/(\text{h}(\text{ft}^2)(^{\circ}\text{F}))$  ( $2.2\text{W}/(\text{m}^2(^{\circ}\text{K}))$ ) shall be cause for rejection.

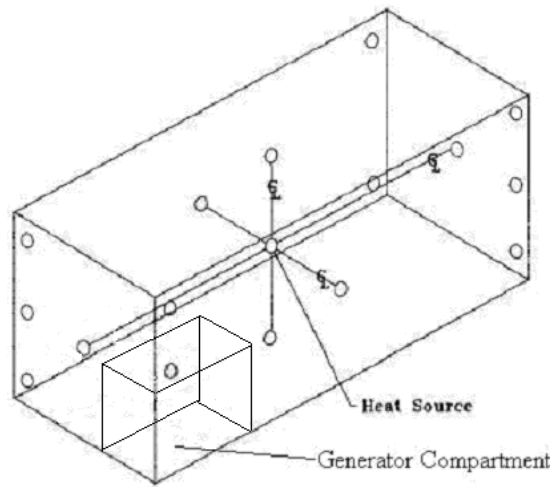


Figure F-5. Interior Thermocouple Placement

**F4.7.8 Fungus and moisture.** Examine the material specifications of all materials used in the container, especially electrical circuits and related components; and verify that all seals, gaskets, cable covers and other elastomer parts are fungi and moisture resistant. Absence of certification that any material used in the container is fungus and moisture resistant shall be cause for rejection.

**F4.7.9 Ozone.** Examine the material specifications of all gaskets, electric cable covers, and other elastomer parts exposed to the atmosphere. Verify that all materials used in the container are ozone resistant. Absence of certification that any elastomer used in the container is ozone resistant shall be cause for rejection.

**F4.7.10 Marine environment.** The exterior of the container in its operational mode shall be tested for corrosion resistance in accordance with MIL-STD-810, Method 509. The container shall be thoroughly examined following the test. Evidence of corrosion due to electrochemical reaction between parts fabricated of dissimilar metals; clogging or binding of moving parts such as doors, latches, leveling jacks, and connector covers; and blistering of protective coatings due to corrosion shall each be cause for rejection.

**F4.7.11 Desert environment.** The exterior of the container shall be tested in accordance with

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MIL-STD-810, Method 510.4, Procedure II, using the following parameters: air velocity  $1750 \pm 250$  ft/min ( $8.9 \pm 1.3$  m/sec); sand composition at least 95% silica ( $\text{SiO}_2$ ) by weight; sand concentration  $1.32 \times 10^{-4}$  lb/ft<sup>3</sup> ( $2.19$  g/m<sup>3</sup>); container in the operational mode with ECU and generator in their operating positions, exposure time 90 minutes per container end and side; and sand removal by broom, hand brush, and 30 psig (207 kPa) compressed air. Sand particle size shall be: 90%  $\pm 2\%$  passing a 150  $\mu\text{m}$  mesh screen, 98%  $\pm 2\%$  passing a 500  $\mu\text{m}$  screen, and 100% passing a 1000  $\mu\text{m}$  screen. Following exposure to the blowing sand, clinging and accumulated sand shall be removed from the container exterior and generator compartment, and the container opened and examined. Presence of sand in the container cargo area; interference between mating parts; and binding of any latch, hinge, door, slide, panel, or other moveable part of the container shall each be cause for rejection.

**F4.8 Safety.**

F4.8.1 Physical hazard control. Examine the container and confirm all moving parts, electrically energized parts, and high temperature surfaces are provided with guards, covers, or insulation to protect personnel from inadvertent contact. Also, confirm that safety guards, covers, and insulation do not interfere with the operation of the container. Verify that any physical hazard that cannot use protective devices is identified, by type, with a plainly visible warning sign. Presence of unnecessary or unidentified hazards shall each be cause for rejection.

F4.8.2 Physical strain control. Verify the physical exertion required when erecting the container for operation in the field, and when striking it for ground transport does not exceed safe limits for the target population (see Appendix D). Any step in the erection or striking sequence requiring exertion exceeding the capabilities of a 5<sup>th</sup> female soldier shall be cause for rejection.

F4.8.3 Electrical ground. Verify that all electrical circuits incorporated in the container are electrically grounded to the container frame, and to the power source ground through the electrical input cable. Also verify that all AC electrical power circuits have a Ground Fault Circuit Interruption (GFCI) device(s). Verify that 1/4-inch diameter grounding stud and wing nut are provided on the container exterior, in a clearly marked location, and that the grounding stud location permits it to be connected to an earth ground, with a grounding wire not more than six-feet long. Verify that a grounding rod kit is provided with the container, and that there is a dedicated storage location for the grounding rod kit inside the container near the grounding stud location. Absence of a required ground, absence of GFCI protection for any circuit; absence of an exterior grounding stud, and absence of the required grounding kit shall each be cause for rejection.

F4.8.4 Steps. Verify that safe access to the container roof is provided that conforms to the guidelines of Appendix D. Absence of access conforming to Appendix D shall be cause for rejection.

F4.8.5 Tread surfaces. Verify the container floor, stair treads, and roof all have non-slip surfaces. Absence of non-slip surfaces in these areas shall be cause for rejection.

F4.8.6 Anti-Entrapment Measures. Verify that the container is provided with anti-entrapment measures to prevent personnel from being locked inside, i.e. an escape hatch that can be opened

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only from the inside, and/or locking and latching mechanisms on the personnel door that permits a locked door to be opened from the inside. Absence of anti-entrapment measures shall be cause for rejection.

F4.8.7 Toxic materials. Examine the material specifications for the container components and verify that in their cured, dried, or other final processed state they do not emit toxic vapors over time or otherwise present a health hazard to personnel during transportation, operation, or maintenance of the container. If any of the container materials do emit toxic vapors, the air inside the container following the high-temperature storage test shall be sampled and tested in accordance with the NIOSH-approved procedures for the material in question. Container materials that produce an accumulation of toxic vapors inside the container that exceed the NIOSH Threshold Limit Values for the substances present shall be cause for rejection.

F4.8.8 Fire resistance. Two specimens of a production panel 12 by 12 in. (300 by 300 mm) shall be tested for flammability. The specimens shall be prepared and tested in the following manner:

- a) Drill a 1/4-in. (6 mm) hole in the center of the panel through both skins.
- b) Using a 1-in. (25 mm) diameter hole saw with a 1/4-in (6 mm) pilot, remove the skin only on each side within a 1-in (25 mm) diameter area.
- c) Mount the panel in any appropriate holding fixture in a horizontal position.
- d) Adjust the height of the panel so that the lower skin is approximately 2-12 in. (64 mm) above the top of a standard barrel Bunsen burner.
- e) Adjust the flame height to approximately 5 in (125 mm) with an inner core of approximately 3 in (75 mm).
- f) Apply the flame to the center of the hole in the skin, impinging on the core, for 30 seconds.
- j) At the end of the 30-second period, remove the flame and record the time, in seconds, for burning or glowing to cease, if ignition occurs.

Failure of the specimen to be self-extinguishing within 30 seconds if ignition occurs and evidence of degradation (charring) of material outside a 1.25-in (32-mm) radius from the center point of the drilled hole shall each be cause for rejection.

F4.9 Economic life. The contractor shall provide a report detailing the projected economic life of the container is at least fifteen years. The projection may be made based on historical data regarding the economic life of items having similar design and manufacture, test data, or a combination thereof. Lack of supportive objective evidence in the report shall be cause for rejection.

F4.10 Reliability/Maintainability. The contractor shall provide an analysis demonstrating 80% confidence the container will have a Mission Capable status 90% of the time. The projection may be made based on historical data regarding the reliability and maintainability of items having similar design and manufacture, test data, or a combination thereof. Lack of supportive objective evidence in the report shall be cause for rejection.



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F4.11 Ease of maintenance.

F4.11.1 Access. Using operators meeting the anthropometrical requirements of Appendix C, demonstrate that all routine preventative maintenance tasks can be performed without removing or disassembling any part of the container.

F4.11.2 Latches. Manually operate all latches on the container door(s) and removable panel(s) and verify that they are properly adjusted.

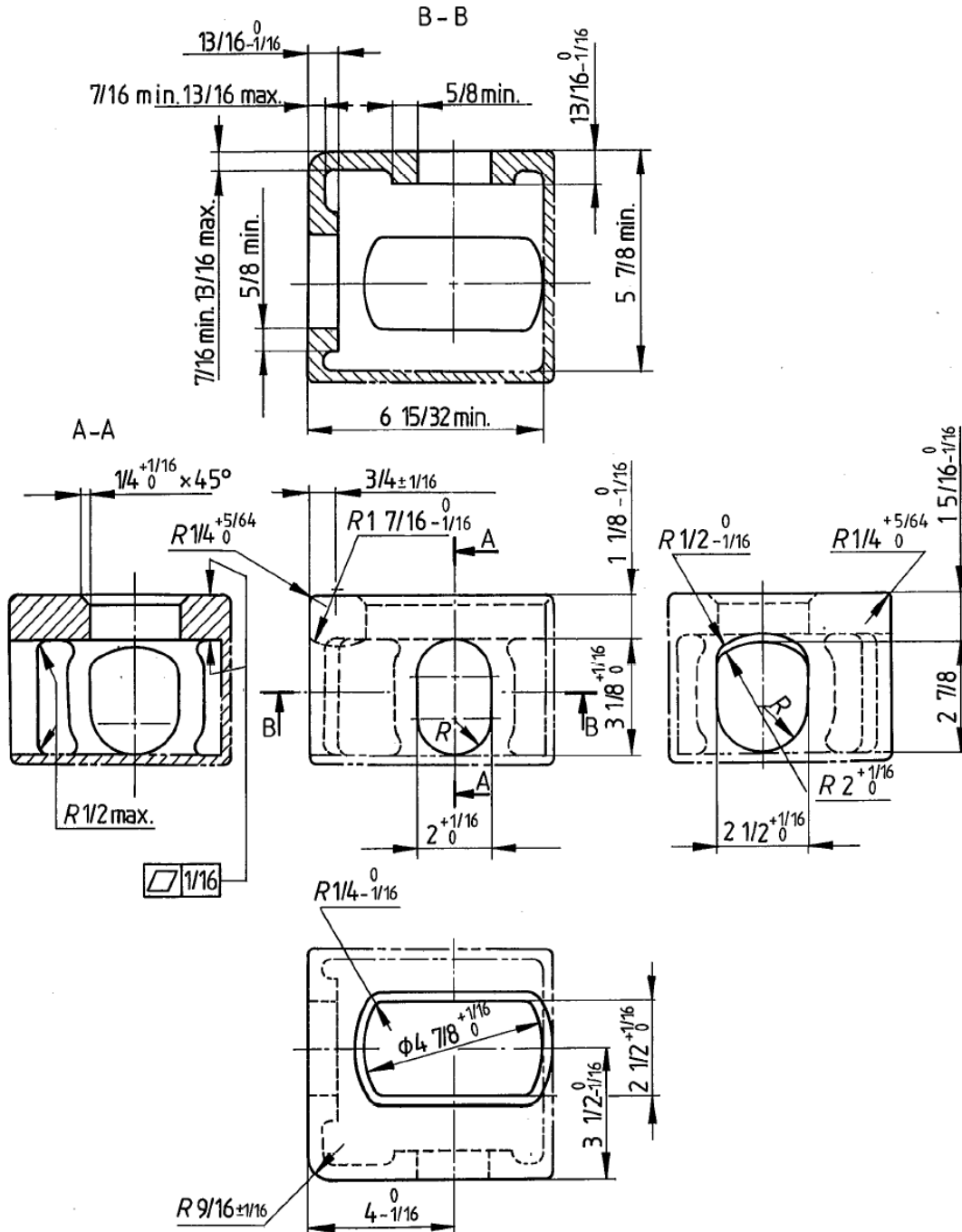
F4.11.3 Fastening devices. Examine all removable fasteners on the container and verify that all use some means of keeping tightness and none are staked, swaged, or otherwise deformed. Verify that all parts subject to repair by replacement are mounted with reuseable fasteners.

F4.11.4 Cleaning. Within the container locate all points that may become collection points for cleaning fluid and verify each has a drain port.

F4.11.5 Protective finish. Confirm that all metal parts of the container have a protective finish in accordance with MIL-STD-171, finish 7.3.1 plus 20.24 (CARC) for aluminum and finish 5.1.1 plus 20.24 for ferrous metals.

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Dimensions in Inches



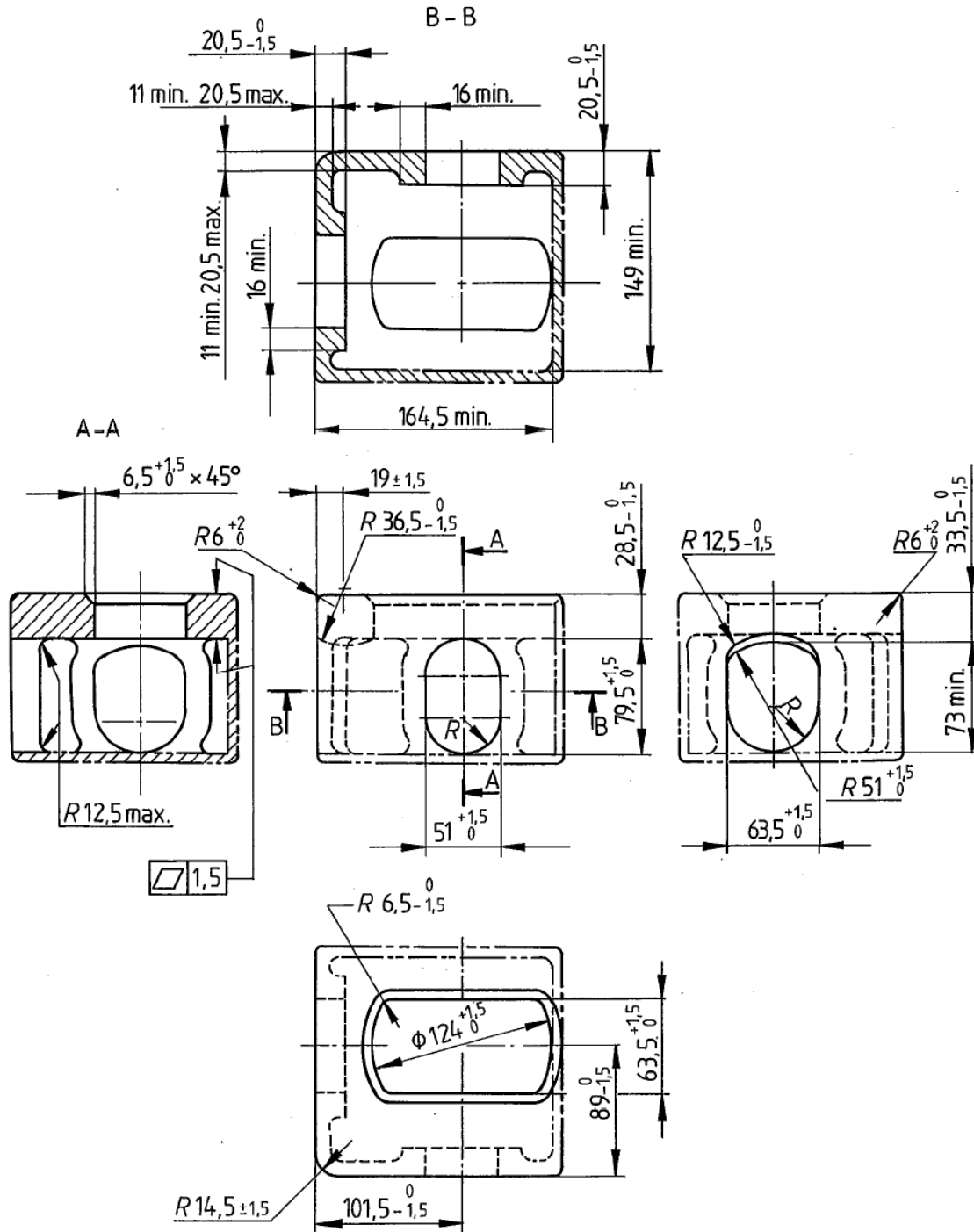
NOTES

- 1 Solid and broken lines (— and ---) show surfaces and contours which shall be physically duplicated in the fitting.
- 2 Phantom lines (— · — · —) show optional walls, which may be used to develop a box-shaped fitting.

FIGURE F-6. Top Corner Fitting Dimensions (Inches), ISO 1161

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[Dimensions in millimetres]



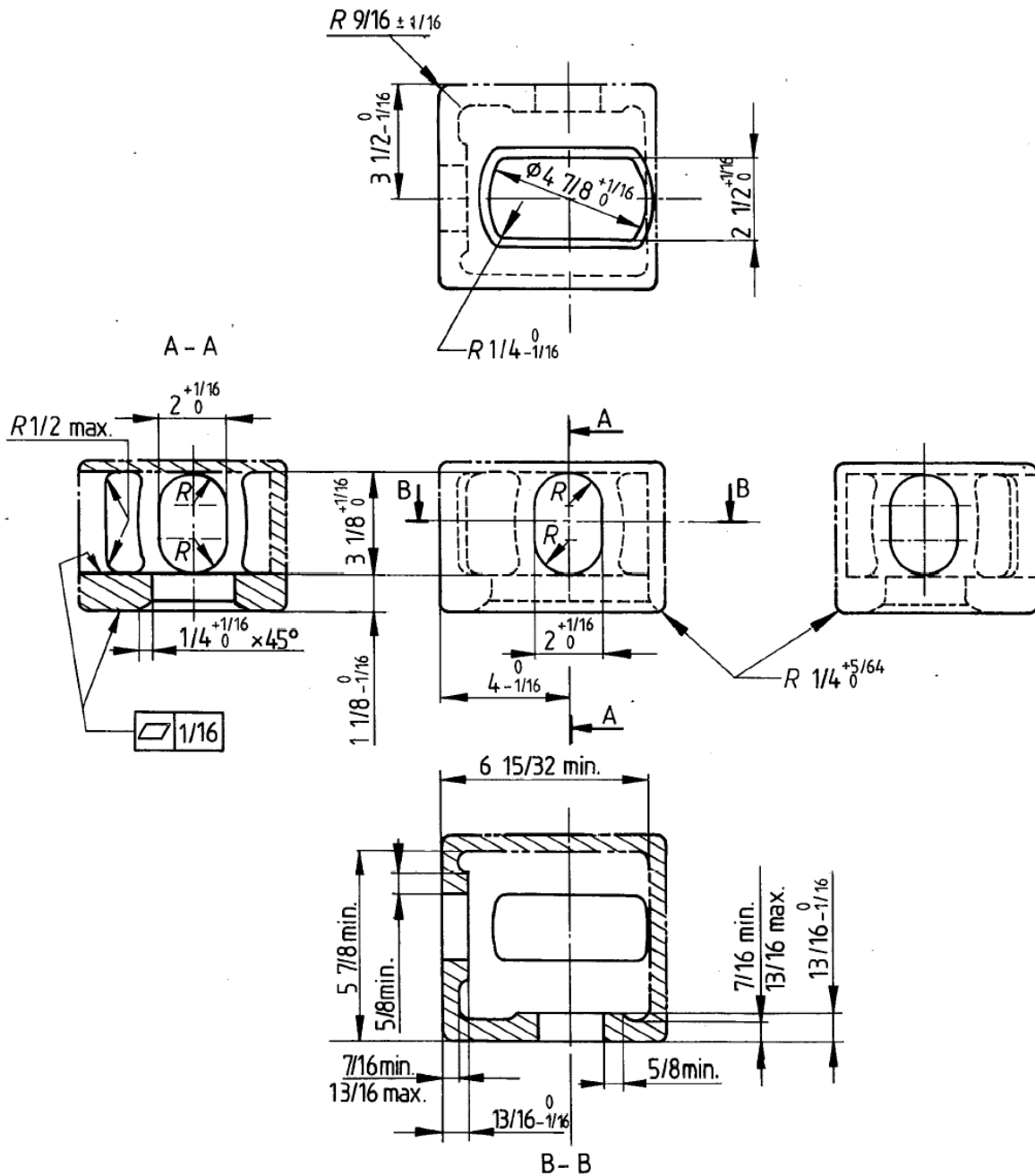
NOTES

- 1 Solid and broken lines (— and ---) show surfaces and contours which shall be physically duplicated in the fitting.
- 2 Phantom lines (— · — · — ·) show optional walls, which may be used to develop a box-shaped fitting.

Figure F-7. Top Corner Fitting Dimensions (mm), ISO 1161

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[Dimensions in inches]



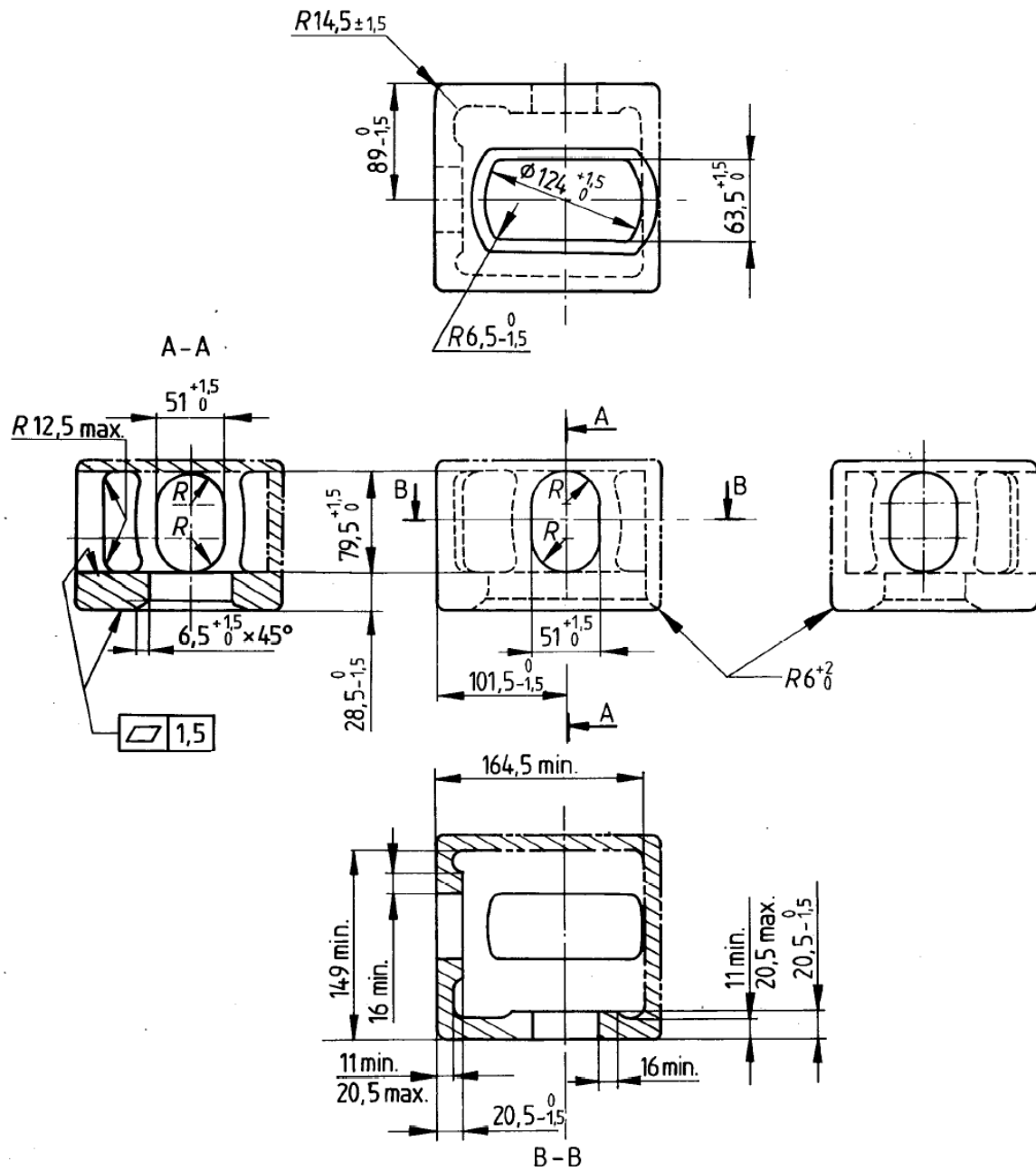
NOTES

- 1 Solid and broken lines (— and ---) show surfaces and contours which shall be physically duplicated in the fitting.
- 2 Phantom lines (— · — · —) show optional walls, which may be used to develop a box-shaped fitting.

Figure F-8. Bottom Corner Fitting Dimensions (Inches), ISO 1161

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[Dimensions in millimetres]

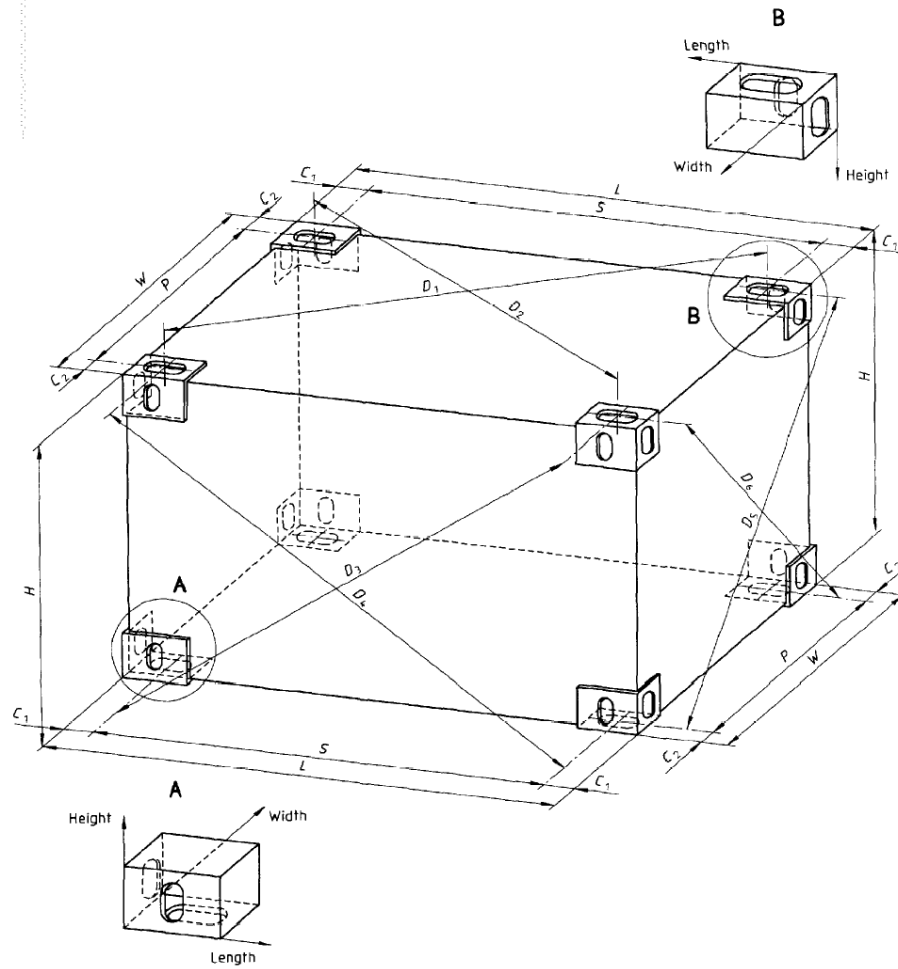


NOTES

- 1 Solid and broken lines (— and ---) show surfaces and contours which shall be physically duplicated in the fitting.
- 2 Phantom lines (— · — · —) show optional walls, which may be used to develop a box-shaped fitting.

Figure F-9. Bottom Corner Fitting Dimensions (mm), ISO 1161

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- $C_1$  Corner fitting measurement 101,5 mm  $^{0}_{-1,5}$  mm (4 in  $^{0}_{-1/16}$  in)  
 $C_2$  Corner fitting measurement 89 mm  $^{0}_{-1,5}$  mm (3 1/2 in  $^{0}_{-1/16}$  in)  
 $D$  Distance between centres of apertures, or projected reference points therefrom, of diagonally opposite corner fittings, resulting in six measurements:  $D_1$ ,  $D_2$ ,  $D_3$ ,  $D_4$ ,  $D_5$  and  $D_6$   
 $H$  Overall height  
 $L$  External length of the container  
 $P$  Width between centres of apertures in corner fittings  
 $S$  Length between centres of apertures in corner fittings  
 $W$  External width of the container

NOTE — Dimensions  $L$ ,  $H$  and  $W$  are measured along the appropriate edges.

Freight container designation	$S$ (ref.)			$P$ (ref.)			$K_1$ max. <sup>1)</sup>		$K_2$ max. <sup>2)</sup>	
	mm	ft	in	mm	ft	in	mm	in	mm	in
1C	5 853	19	2 7/16	2 259	7	4 31/32	13	1/2	10	3/8

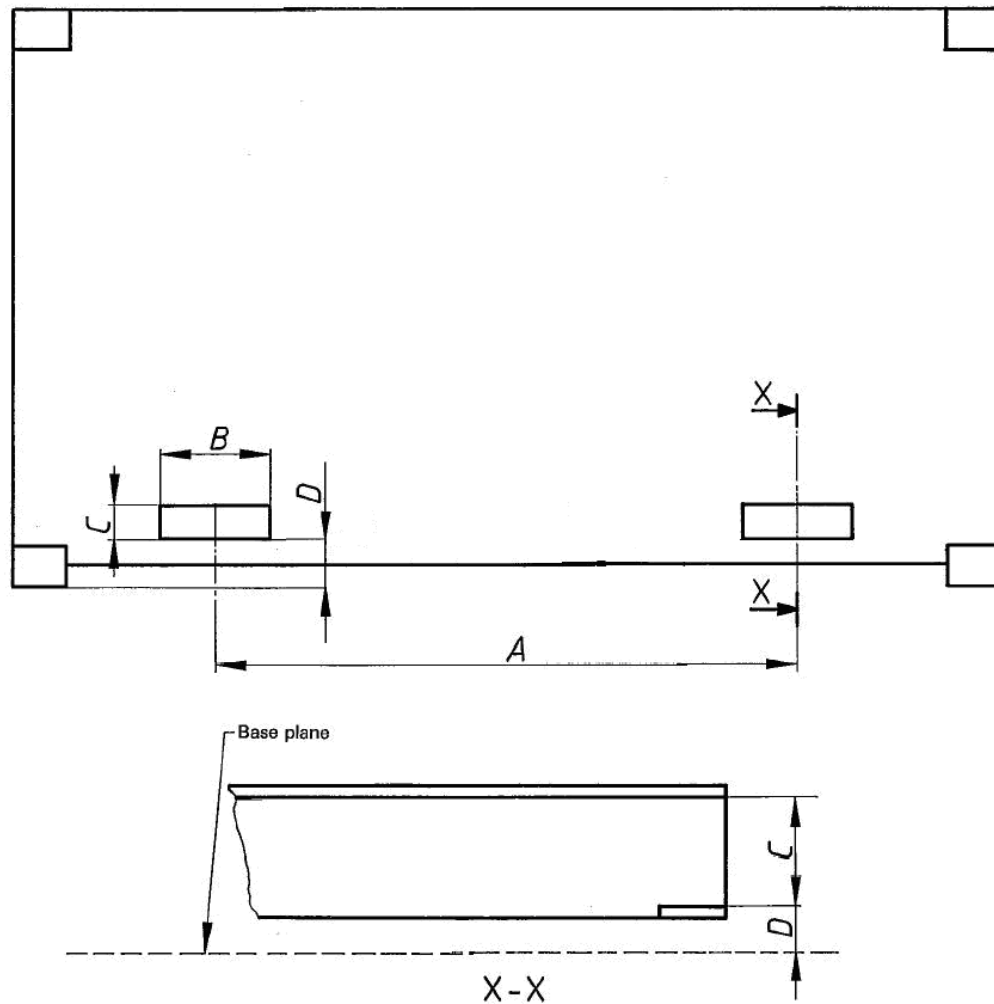
NOTE — Attention of manufacturers is drawn to the vital importance of accurately maintaining the reference dimensions of  $S$  and  $P$  (see figure ). The tolerances to be applied to  $S$  and  $P$  are governed by the tolerances shown for the overall length and width in this International Standard and in ISO 1161.

1)  $K_1$  is the difference between  $D_1$  and  $D_2$  or between  $D_3$  and  $D_4$ ; therefore  $K_1 = |D_1 - D_2|$  or  $K_1 = |D_3 - D_4|$ .

2)  $K_2$  is the difference between  $D_5$  and  $D_6$ ; therefore  $K_2 = |D_5 - D_6|$ .

Figure F-10, Corner Fitting Location Dimensions, ISO 668

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Container	Dimensions							
	Fork-lift pockets for loaded and unloaded containers							
	mm				in			
	A	B	C	D	A	B	C	D
1C	2 050 ± 50	355 min.	115 min.	20 min.	81 ± 2	14 min.	4 1/2 min.	0,8 min.
NOTE — C = Clear opening								

Figure F-11. Fork Lift Pocket Dimensions